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PHARMACEUTICAL JOURNAL

AND

TRANSACTIONS.

VOLUME II.

1842-3.

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EDITED BY

JACOB BELL.

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PREFACE TO VOL. II.

The original design of this Journal, was merely to establish a medium of communication in which information might be conveyed to all parts of the country respecting the Transactions which were taking place among the Pharmaceutical Chemists in the metropolis. To this periodical stimulus may be attributed, in some measure, the success and progress of the Society, to the welfare of which the pages of the Journal have been devoted.

In addition to the Transactions of the Society, the Journal, shortly after its commencement, became the receptacle of a few extracted articles and miscellaneous communications on subjects relating to Pharmacy, the number of which gradually increased until it was found desirable to adopt a more systematic arrangement of the materials than was at first attempted. Some of the most eminent professors of Pharmacy and Chemistry in this country have encouraged the undertaking by furnishing instructive papers and useful suggestions, by which means the character of the work has been raised, and the Editor is enabled, without taking any credit to himself, to appeal to the names of Thomson, Pereira, Ure, Phillips, Fownes, Donovan, and other authorities, as regular contributors. Mr. Redwood, whose first course of lectures on Practical Pharmacy at the establishment of the Society, was favourably received by a numerous class, continues to assist in the editorial labours of the Journal.

While this valuable aid has conferred upon the work a more scientific standing, it has been found difficult, and indeed impossible to adapt the materials to the capacity and condition of all the readers, many of whom have not had the advantages of professional education, which would have enabled them to understand and appreciate those papers which to the analytical Chemist might probably possess the greatest interest. This difficulty is one which will gradually diminish, and it is to be hoped, ultimately cease, as the diffusion of knowledge, under the auspices of the

PHARMACEUTICAL SOCIETY, dispels the cloud which has hitherto hung over the Chemists and Druggists of Great Britain.

The Report of the Council (page 741, No. 12) gives general information respecting the progress of the Society during the year comprised in this volume. The success which has attended the School of Pharmacy is one of the most important features in the Institution, and it is encouraging to observe, that the disposition to introduce a system of education for the Pharmaceutical Chemists, is not confined to the metropolis, but is extending itself throughout the country.

With the exception of a few items which are promised shortly, nearly all the subscriptions of Members and Associates have been received. Only four Members have seceded from the Society by resignation, and the number whose names are erased from the list, amounts to about twenty, arising from deaths or retirement from business. Several Members and Associates have lately been admitted, and we may therefore consider our numbers about the same as at the last publication of the list. Much, if any, increase was not to be expected during the first year in which the present regulations respecting admission came into operation.

The election of Country Members on the Council has been proposed as a means of cementing the union of our body and giving a more completely representative character to the Society. It is worthy of remark however, that all the Country Candidates were proposed by Members residing in London; of seven who were proposed, only five consented to serve, and of these only two were elected. If the Country Members had generally supported the five Country candidates, their election would have been inevitable, and we may infer from the result of the ballot, that the majority have confidence in their London representatives.

338, *Oxford Street*, *June* 1*st*, 1843.

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ON THE PROFESSIONAL CHARACTER OF THE PHARMACEUTICAL CHEMIST.

While we are endeavouring, by regulations of a collective nature, to raise the character and increase the respectability of our body, it is incumbent upon us all, in our individual capacity, to promote the same object in those matters which relate to the internal management of our business. It is also desirable, that we should agree on certain general principles, and simultaneously adopt the same line of conduct, as far as may be found compatible with the adventitious circumstances in which our members are placed, in regard to locality and station.

So little intercourse has hitherto been kept up among Chemists and Druggists, that there is, as might be expected, some difference of opinion, not only as to the course which is most conducive to our credit and respectability, but also as to the precise boundary within which are included our normal and legitimate functions. A line of business which, in one locality constitutes a leading feature in the trade, is considered in another to be derogatory and unprofessional. The manner in which business is conducted among some of our members, is, by others, repudiated as approaching to empiricism; and the course which is adopted by some to raise their reputation, is avoided by others from an idea that it would have an opposite tendency.

In the remarks which we are about to offer on this subject, it is our desire, as much as possible, to reconcile what may at first sight appear to be inconsistencies, and to point out the manner in which, according to our judgment, each particular class of business comprised in the general routine, may be carried on without any sacrifice of that standing and character which, as a body, we should all endeavour to maintain.

It is evident that there is, and must always be, an essential difference between town and country business. The division of labour in all cases prevails to the greatest extent in large towns and cities, and extends its influence in proportion to the increase of population and the advancement of civilization. The Apothecaries were originally incorporated with the grocers into one

body. After the separation took place, an intermediate class, namely, the Druggists, sprung up, and the three bodies are now entirely distinct, although the functions occasionally merge into each other, in the case of some individuals residing in the small towns.

In many towns the Druggists invariably fit up one side of their shops with grocery and spices, while, on the other side, they carry on the business of Dispensing Chemists. This practice is, under present circumstances, unavoidable; and if the business of the Chemist be creditably conducted, the sale of grocery ought not to be considered to detract from the respectability of the establishment.

The sale of oils and colours is also a collateral branch of the business of Chemists and Druggists in the country, and although some persons may take exception to this vocation, as not being pharmaceutical, we must not hastily denounce a custom, which appears to be conducive to the convenience of the public, and in fact almost unavoidable, in those localities where it prevails. In the preparation of colours for artists, much chemical knowledge is required, and in places where the demand is not sufficient to support a Colourman, the office naturally falls upon the Chemist. Some of the graduates of the College of Pharmacy in Philadelphia carry on this branch of the business to a considerable extent, and one of our most distinguished dispensing houses in London, has for many years been celebrated for the manufacture of carmine.

The sale of patent or proprietory medicines, which is generally conjoined with retail business, is a department which ought not to be made prominent. The principle involved in the sale of such medicines, namely, that of recommending "infallible specifics," for various disorders, is not in accordance with sound medical knowledge, and in some cases amounts to dishonesty and imposition. Yet the encouragement given by government to this traffic, on account of the revenue which it produces, the sanction given by the medical profession to some nostrums (James's powder, black drop, and a few others), and above all, the propensity which exists in the public mind to patronize secret remedies, and to believe the improbable statements in which many of them are enveloped, these and other causes have always contributed to render the sale of patent medicines almost inseparable from the drug trade. The retail Chemist however, is not responsible for the efficacy of these medicines, or the accuracy of the panegyrics; he is not supposed to be acquainted with their composition, or to give any opinion in the matter. He is only the agent, and the purchaser buys the articles on his own judgment, and at his own risk. It should

be understood, however, that by pushing this kind of trade, and advertising or recommending secret medicines to any great extent the Druggist approximates, in the same proportion to another class, namely, the "patent medicine venders," who are a distinct body.

The preparation of horse and cattle medicines deserves more attention than is usually bestowed upon it by Pharmaceutical Chemists. The sophistication of horse powders and other compounds is so prevalent, that a person who offers genuine horse medicines is unable to compete with his neighbours in price, and consequently has a very limited sale for these articles. Farriers and grooms are not likely to be competent judges of the quality of drugs; they observe with some degree of care the appearance and effect of Barbadoes aloes, the sensible properties of which are comparatively easy of discrimination, and being satisfied that the staple commodity is genuine, they take it for granted that other horse medicines at the same shop are the same. The notion that inferior drugs are good enough for the purpose is confirmed by the fact, that they are more in demand than the best on account of the low price. The retailers are not in all cases aware of the extent of the adulterations; and it being considered a matter of secondary importance, this branch of the business is too often carried on in a manner which is by no means creditable. It is chiefly on this account that the sale of horse medicines is disregarded by many Chemists, who cannot conscientiously adopt the prevalent system, and who find it impossible in any other way to compete successfully in the market. There is, however, no just reason for considering this branch of the business derogatory to the Pharmaceutical Chemist; and in order to place it on its proper basis, it is only necessary to conduct it in a respectable manner, and thus to overcome the prejudice which prevails on the subject. An occasional exposure of existing abuses is likely to be useful in this instance as well as others.

Perfumery, tooth and nail brushes, surgical instruments, and a variety of other miscellaneous articles, enter more or less into the province of the Chemist and Druggist especially in the country; and in this matter, each individual is of course at liberty to use his own discretion, but a conspicuous display of goods of that description is not calculated to improve the character of a business, as a Pharmaceutical Establishment.

It must, therefore, be acknowledged that in all these cases the test of respectability and professional character has reference more to the education of the parties, and the manner with which they perform their duties, than to the precise line of business in which their abilities are directed; or, in other words, although the preparation and sale of drugs constitutes our chief and most

legitimate office, the other collateral branches may be attached to it, according to circumstances, without of necessity detracting from the character of the Pharmaceutical Chemist.

A grocer may fit up a corner of his shop with physic bottles, and write the words "Chemist and Druggist" over his door; he may rank high as a grocer, and carry on a flourishing trade, but the sale of a few drugs does not entitle him to the name of a Pharmaceutical Chemist; and by assuming it he adds nothing to his respectability. The same remark applies equally to oilmen and "general dealers." The distinction between these parties and Chemists and Druggists consists in the fact, that the former have received no pharmaceutical education, and sell drugs as an accessory vocation, while the latter are supposed to be qualified especially for the dispensing of medicines, the grocery, &c. occupying a secondary and less prominent part.

It is, however, difficult in some cases to distinguish by any outward sign the true Chemist and Druggist from the person who assumes the name without possessing the qualification: a doubt which will, we trust, be removed when the PHARMACEUTICAL SOCIETY has extended its influence generally throughout the country.

In the course of a few years we anticipate that all regularly educated Chemists will possess the diploma of the Society, which will then be a mark of distinction and a test of proficiency.

While on this subject we may be allowed to caution our brethren against making a false estimate of the value of the diploma at the present time. We have already had occasion to remark, that in the endeavours which are now being made to raise the professional character of the trade, we must take those who are already established, as we find them. We may feel conscious that few among us are as near perfection as we could desire, and yet we are bound to consider that *all existing Chemists and Druggists* are to a certain extent qualified, and as such entitled to admission. This is a principle on which any legislative enactment must proceed, and it was recognized, in reference to the Apothecaries, at the passing of their act in 1815. The undertaking in which we have embarked is one which involves expense, and the benefit of which is contingent. We may, therefore, infer that those who have joined in the enterprise feel a lively interest in the credit and advancement of their profession, and are thus induced to make a pecuniary sacrifice, which those who are not entitled to rank as Chemists would be likely to shrink from. The possession of the diploma, by an original member, indicates that the possessor is actually a Chemist and Druggist, has been brought up to the business, and is a participator in the effort which we are making to introduce an

improved system in this branch of the medical profession. But it does not imply proficiency, because the original members have not undergone an examination; and it is, therefore, desirable not to attribute to it, in the first instance, that prospective value which it will in course of time acquire.

We would also suggest, that a *too prominent* display of the insignia of membership, or an *ostentatious* allusion to the PHARMACEUTICAL SOCIETY in public advertisements, is calculated, especially in the present early stage of its existence, rather to call forth animadversions from parties who are disposed to be censorious, than to confer that kind of character on the advertiser which it is his object to acquire. This is more particularly the case when such advertisements have reference to those subsidiary and collateral branches of our business to which we have already alluded. Our attention has been directed, in several cases, to shop bills, in which oils, colours, grocery, brushes, and patent medicines were enumerated in a very conspicuous manner, the words, "Member of the Pharmaceutical Society," being equally prominent. It is to be regretted that any member should make use of the Society in such a manner, as the circulation of handbills of that description is likely to bring discredit upon us. While we would not wish, in any way, to restrain our members from adopting proper means for making themselves known to the public, and extending their business, we think it particularly desirable that they should avoid quackery, and that kind of "puffing" which is discreditable to any profession.

We have also seen on such bills the words, "Medical advice gratis;" the advice alluded to being given by the Chemist himself. This we consider to be exceeding our legitimate province. We have on many occasions been called upon to advocate the privileges and rights of Chemists and Druggists, and to prove that a certain *discretionary power* must necessarily belong to us, in recommending or suggesting remedies in our own shops, when regular medical advice either cannot be obtained, or is not required; the grounds upon which we lay claim to this privilege are well supported by facts and experience, and have reference to the interests and welfare of the public, as well as to our own.

The difficulty of drawing any precise line between the province of the Chemist and the circumstances under which he ought to decline to act, renders discretion on his part especially necessary. Those who court medical practice and undertake to cure every case which presents itself, and who, by advertising "Medical advice," lead the public to suppose that they are qualified practitioners, injure the cause which we are advocating by furnishing an illustration of the only argument which could be brought against our views. The necessities of the public

lead them to apply to us on some occasions, but it is our duty to make our customers fully understand that we act as Chemists, and not as medical men, and to refer them to medical men whenever their cases require further advice than a knowledge of pharmacy enables us to give.

We may further illustrate the distinction between an Apothecary and a Druggist by an instance. A man who has been educated as an apothecary, but who, on account of some technical obstacle, has not passed an examination, purchases a business of a surgeon and apothecary, binding himself down not to visit patients, but to restrict his practice to his own shop, the surgeon covenanting on his part not to dispense medicines within a certain distance. The purchaser, not being legally an apothecary, styles himself a Chemist and Druggist, but carries on an extensive practice behind his counter, or in his surgery; and fearing an action on the part of the Apothecaries' Company, he applies for admission to the PHARMACEUTICAL SOCIETY, under the idea that the Society would bear the expense of defending it. In this case, the party is in fact a qualified apothecary, although his qualifications have not been tested; his avocation is that of a medical man, who has purchased a practice under certain restrictions, but who evades the law, by assuming the name of a Chemist and Druggist. He is therefore ineligible as a Member of the PHARMACEUTICAL SOCIETY.

There are many Chemists who are in the habit of bleeding, cupping, applying leeches, and drawing teeth, and we have seldom heard any objection raised by the medical profession against this custom. It is, however, chiefly in country towns or in the outskirts of cities that this practice occurs to any considerable extent; among a majority of the Chemists in London it is considered foreign to the business, being practised by a distinct class of persons, some of whom have no pretensions to medical education. There is no law by which a Chemist can be prohibited from performing these operations, because being surgical they are not included in the provisions of the Apothecaries' Act, and the College of Surgeons not being protected by an Act of Parliament, have no power to interfere. The adoption of this practice is, therefore, optional; and there are many persons who consider that all Chemists ought to bleed, cup, and apply leeches as a part of their regular duties. These operations being directed to be performed in the prescriptions of Physicians, in many cases which are strictly medical, the Chemist, it is said, ought to be able to perform all that is required, instead of being obliged to call in a third person. Considerable inconvenience, and, in some cases, injustice, is experienced both by the Physician and the Chemist, when the abstraction of a few ounces of blood renders it neces-

sary to call in an Apothecary, who is qualified from his station to act in all capacities, medical, surgical, and pharmaceutical. Whether it be right or not for the Chemist to perform these offices, is a question on which there may be two opinions; but it is quite clear, that if he undertake to do so, he ought to be duly qualified.

It should be understood, that the Apothecaries' Act is not merely designed for restraining unqualified practitioners, but that it operates with equal severity on medical men or others who possess the requisite knowledge, but who do not possess the licence of the Company. The only exception is in favour of Chemists and Druggists, and this exception was necessary from the cause above stated, namely, the difficulty of defining the precise boundary line between the functions of the two classes. The distinction however, is, we believe, practically maintained by a large proportion of our body, and it is our interest as well as our duty to maintain it. It is for each individual to decide which course he will take. If he decide upon being a Chemist, he may it is true be called upon to give advice occasionally, but he does it as a matter of necessity, and ought not to court practice: if he prefer the avocation of the Apothecary, he may in like manner be called upon to retail drugs occasionally, but he does not increase his respectability by pushing the trade.

In taking a dispassionate view of the subject, we cannot fail to come to the conclusion, that the professional credit and character of the Pharmaceutical Chemist is dependent upon the manner in which he performs his own particular duties. The sphere in which he is most calculated, by his education and position, to attain to eminence, is in the practical operations of Pharmacy—the application of chemical science to the preparation of remedial agents. Although he must in some degree yield to the force of circumstances, by descending to collateral branches of business, which the custom of the country or of his particular neighbourhood has united with his own, he should still maintain his true character by assigning to each respective duty the degree of prominence to which it is entitled. And while, on the other hand, he is called upon occasionally to perform functions which approximate to those of medical men, he should not delude himself into the belief that his standing in society will be elevated in proportion as he induces the public to consider him a Doctor.

TRANSACTIONS
OF
THE PHARMACEUTICAL SOCIETY.

PHARMACEUTICAL MEETING,
JUNE 8th.

MR. PAYNE, VICE-PRESIDENT, IN THE CHAIR.

The Chairman said, that in commencing the second year's Proceedings of the Society it would, perhaps, be expected of him, in the official capacity with which he had again been invested, to make some allusion to the past progress and future prospects of their scientific meetings. In looking at what they had done during the past year, he thought he might congratulate his brethren, not only upon the amount of valuable information which had been communicated at their meetings, but upon the manner in which it had been brought forward, and in which their discussions had been uniformly conducted. Many interesting papers had been furnished, and the greater part of them by members of their own body, who, had it not been for these meetings, would probably never have thought of making public the subjects of their communications. Two months had elapsed since they last met together, and during this time the Society had assumed a more mature character. The School of Pharmacy had been opened with a course of lectures on Medical Botany, and the attendance was such as to justify the belief, that the advantages of the institution were fully appreciated. He had no doubt that the lectures in the autumn would be still more numerously attended; and that these, together with the scientific meetings, would tend to confer a lasting benefit upon their members and the community at large. He must, however, impress upon the minds of all present, that to the Members generally the Council were obliged to look for the matter to be brought forward at these meetings; and he trusted that they should be enabled to maintain, if not to increase the interest and importance of these occasions for their mutual improvement. He introduced to the notice of the meeting, a paper

ON THE ACTION OF CARBONATE OF POTASH ON GUM RESINS.

BY MR. HULSE.

Some years since, my attention was drawn to the action of carbonate of potash on myrrh, which induced me to try its effect

in reducing other gum resins, and the result was perfectly satisfactory. The intrinsic value and utility of this alkaline carbonate as an agent, when used according to the formulæ hereafter referred to, will become manifest to the Practitioner and to the Pharmaceutist, especially in the preparation of the compound mixture of iron, the compound pills of iron, the compound galbanum pills, and, indeed, every other mixture and pill which contains a gummo-resinous ingredient in its composition.

With regard to myrrh, if one part of carbonate of potash be added to two parts of myrrh in the lump, and rubbed together, the alkali produces complete saponification; and if to this be added medicated or distilled water, we obtain an elegant emulsion of myrrh, and nearly the whole of the gum resin is retained in suspension, which would not be the case without the aid of the carbonate of potash. If the compound mixture of iron is prepared by triturating the myrrh with carbonate of potash, then with the usual proportion of sugar, using the raw instead of refined, adding first the rose water, then the sulphate of iron, powdered, and, lastly, the spirit of nutmeg, it will not be an unsightly mixture, and the precipitate will be very trifling.

Again, in the compound pill of iron, if carbonate of potash is used instead of carbonate of soda, and raw or muscovado sugar in lieu of the refined, a pill mass can be compounded with less trouble than by following the college formula, and which will retain a convenient pilular consistency for any reasonable period.

Take of

Myrrh in lump, two drachms, reduce it to powder in an iron mortar by
Carbonate of potash, one drachm, then add
Sulphate of iron, powdered, one drachm,
Raw sugar, one drachm. Mix, and beat all into a mass, without any liquid. Attention to this last remark is necessary, for the addition of any liquid renders the mass too soft, the raw sugar being sufficient to bring it to a proper consistence.

The solubility of this pill is such, that after having been made six months, I put two pills, of five grains each, into a glass of water, about the temperature of the stomach, and they were completely disintegrated in the course of two hours. If water will thus serve to dissolve these iron bullets, as they are sometimes termed, we may expect the fluid of the stomach would have a much quicker action upon them.

I will now refer to that hitherto troublesome preparation, the compound galbanum pill. This pill, which to most gentlemen present has ever been an annoyance, can be as easily and as readily prepared as the preceding one, and becomes as tractable and as convenient for making into pills as any other mass. Without presuming to deviate materially from the instructions given in the Pharmacopœia, I proceed as follows:

Take of

Myrrh in lump, Sagapenum } of each one drachm and a half.

Galbanum, one drachm.

Asafœtida, half a drachm. Triturate these with two drachms of carbonate of potash, in an iron mortar, until the whole are sufficiently reduced, add

Raw sugar, two drachms, and beat all together into a mass, without any liquid, which mass will retain its consistency for any reasonable period.

The pill of aloes with myrrh, compound squill pill, compound rhubarb pill, and other similar preparations, will be considerably improved if made with the assistance of carbonate of potash and raw sugar; but with every other than the compound galbanum pill and compound pill of iron a small portion of water must be used.

The raw sugar (saccharum non-purificatum), as an ingredient in compound pill of iron, is decidedly preferable to the refined, which alone will not form a mass.

In all pill masses and mixtures containing gum resins, the Pharmacopolist will find it preferable to use ingredients that have been powdered in his own premises.

To show how readily the dispenser may obtain these in the greatest purity, I have placed upon the table samples of six of the most valuable medicinal gum resins, reduced to powder by carbonate of potash with great facility; their odour and flavour are particularly good; but the colour of some of them is not so bright as when obtained from the wholesale Druggist.

In examining the solubility of gum resins in water with the aid of carbonate of potash, I find them to vary considerably. Myrrh is the most soluble, ammoniacum is next, sagapenum third, while galbanum and asafœtida do not appear to be much, if at all, assisted by it. In galbanum there is a second stratum of precipitate, very flocculent, lying upon one more dense, but that is not the case with any other; and I question if it would be found so invariably in every sample of the gum, for the analysis of gum resins is differently stated by Chemists, evidently owing to differences in their qualities and composition.

This subject leads me to notice the practice of some of our brethren who keep, ready prepared, an emulsion of myrrh, for the purpose of dispensing Griffiths's mixture more quickly. This is very objectionable, inasmuch as the emulsion by keeping becomes thin, and on mixing the other substances, a rapid precipitation takes place, leaving the bottle more than half-filled with a nearly transparent fluid.

Mr. Ince questioned the propriety of adding carbonate of potash to those pills in which no alkali is ordered by the college, as it would be incompatible with many substances occasionally ordered in such pills.

A discussion of rather a conversational nature ensued, from which it appeared to be the general opinion of the meeting that the suggestions of Mr. Hulse were worthy of consideration as a means of facilitating the reduction of gum resins to a more tractable and less variable consistence, but that it should not in any way interfere with a strict adherence to the directions of the college in dispensing prescriptions.

ADULTERATION OF THE CANTHARIS VESICATORIA

BY MR. JOHN MACKAY.

A SPECIES of adulteration of the above insect came lately under my notice, which, from its singularity, I am induced to communicate. I do this more readily, as I am not aware of the circumstance having been mentioned before.

From an ounce weight of the flies, I picked, in a few minutes, forty-six various coloured glass beads. I estimate the weight of glass in this form to amount to upwards of three ounces in a pound weight of the cantharides. The late Dr. Duncan, in speaking of the adulteration of cantharides, says, "the *melolontha vitis* is *sometimes* found mixed in considerable numbers with the cantharides. They are easily distinguished by their almost square body, and as they do not stimulate the skin, should be picked out before the cantharides are powdered."* Pereira, and other writers, mention the *powder* only as liable to adulteration, and chiefly with euphorbium. In Dr. Christison's last work, he says, "in the entire state cantharides *are scarcely subject to adulteration* in this country. In Germany, the *cetonia aurata* of Fabricius, or *scarabæus auratus* of Linnæus, the golden beetle is sometimes mixed with it; but this insect may be known by its greater proportional breadth and flat belly."† There is, therefore, no evidence of any extraneous matter being introduced to the flies, excepting the golden beetle; which, of course, is at once distinguishable from its appearance.

The addition of glass beads to cantharides, whether it be accidental or fraudulent, ought to be exposed, as the particles of glass, when reduced to powder with the flies, and applied for the purpose of vesication, must prove a source of extreme irritation to the skin.

55, George Street, Edinburgh, 16th April, 1842.

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* *Vide* Duncan's Dispensatory, page 276.

† *Vide* Christison's Dispensatory, page 264.

It appeared to be the general opinion of the meeting, that the adulteration of the flies, mentioned by Mr. Mackay, was an accidental circumstance, it being thought that the cost of the beads would be as great as that of the cantharides.

ON POTATO SUGAR.

BY ANDREW URE, M.D., F.R.S.
Honorary Member of the PHARMACEUTICAL SOCIETY.

ABOUT two years ago, a sample of sweet mucilaginous liquid was sent me for analysis by the Hon. the Commissioners of Customs. It was part of a quantity imported in casks at Hull from Rotterdam; it was called by the importers *vegetable juice*. I found it to be imperfectly saccharified starch or fecula; and on my reporting it as such, it was admitted at a moderate rate of duty. Three months since, I received a sample of a similar liquid from the importer at Hull, with a request that I would examine it chemically. He informed me, that an importation just made by him of thirty casks of it had been detained by orders of the Excise till the sugar duty of twenty-five shillings per cwt., of solid matter it contained, was paid upon it. It was of specific gravity 1.362, and contained eighty per cent. of ill-saccharified fecula.

In the interval between the first importation and the second, an Act of Parliament had been obtained for placing every kind of sugar, from whatever material it was formed, under the provisions of the Beet Root Sugar Bill. As the saccharometer tables, subservient to the levying of the Excise duties under this Act, were constructed by me at the request of the President of the Board, I was aware that fifty per cent. of the syrup of the beet root was deducted as a waste product, because beet root molasses are too crude an article for the use of man. Well saccharified starch paste, however, constitutes a syrup, poor indeed in sweetness when compared with cane syrup or that of the beet root; but then it does not spontaneously blacken into molasses by evaporation, as solutions of ordinary sugar never fail to do when they are concentrated even with great care. Hence, the residuary syrups of saccharified fecula may be all worked up into a tolerably white concrete mass, which, being pulverized, is used by greedy grocers to mix with their dark brown bastard sugars to improve their colour.

It is only within two years that sugar has been in this country manufactured from potato starch to any extent, though it has been long an object of commercial enterprise in France, Belgium, and Holland, where the large coarse potatoes are used for this purpose. The raw material must be very cheap, as well as the labour, for potato flour or starch, for conversion into sugar, has been imported from the continent into this country in large quan-

tities, and sold in London at the low price of sixteen shillings per cwt.

The process usually followed by the potato sugar makers is to mix 100 gallons of boiling water with every 112 pounds of the fecula, and two pounds of the strongest sulphuric acid. This mixture is boiled about twelve hours in a large vat, made of white deal, having pipes laid along its bottom, which are connected with a high-pressure steam boiler. After being thus saccharified, the acid liquid is neutralized with chalk, filtered, and then evaporated to the density of about 1.300, at the boiling temperature, or exactly 1.342, when cooled to 60°. When syrup of this density is left in repose for some days, it concretes altogether into crystalline tufts, and forms an apparently dry solid, of specific gravity 1.39. When this is exposed to the heat of 220° it fuses into a liquid nearly as thin as water, on cooling to 150° it takes the consistence of honey, and at 100°Fahr. it has that of viscid varnish. It must be left a considerable time at rest before it recovers its pristine state. When heated to 270° it boils briskly, gives off one-tenth of its weight of water, and concretes on cooling into a bright yellow, brittle, but deliquescent mass, like barley sugar. If the syrup be concentrated to a much greater density than 1.340, as to 1.362, or if it be left faintly acidulous, in either case it will not granulate, but will remain either a viscid magma, or become a concrete mass, which may indeed be pulverized, though it is so deliquescent as to be unfit for the adulteration of raw sugar.

The Hull juice is in this predicament, and is therefore, in my opinion, hardly amenable to the new sugar law, as it cannot by any means be worked up into even the resemblance of sugar. Good muscovado sugar from Jamaica, fuses only when heated to 280°, but it turns immediately dark-brown from the disengagement of some of its carbon at that temperature, and becomes in fact, the substance called *caramel* by the French, which is used for colouring brandies, white wines, and liqueurs. Thus starch or grape sugar is well distinguished from cane sugar, by its fusibility at a moderate heat, and its unalterability at a pretty high heat. Its sweetening power is only two-fifths of that of ordinary sugar. A good criterion of incompletely formed grape sugar, is its resisting the action of sulphuric acid, while perfectly saccharified starch or cane sugar is readily decomposed by it. If to a strong solution of imperfectly saccharified grape sugar, nearly boiling hot, one drop of sulphuric acid be let fall, no perceptible change will ensue; but if the acid be dropped into solutions of either of the other two sugars, black carbonaceous particles will make their appearance. The article which was lately detained by the Excise for the high duties at Hull is not affected by sulphuric acid, as are solutions of cane sugar, and of

the well made potato sugar of London; and for this reason I gave my opinion in favour of admitting the so called vegetable juice at a moderate rate of duty.

I subjected the solid matter, obtained by evaporating the Hull juice, to ultimate analysis, by peroxide of copper, in a combustion tube, with all the requisite precautions; and obtained in one experiment 37 per cent. of carbon, and in another 38 per cent., when the substance had been dried in an air-bath heated to 275°. The difference to 100 is hydrogen and oxygen in the proportion to form water. Now, this is the constitution of grape sugar. Cane sugar contains about 5 per cent. more carbon, whereby it readily evolves this black element by the action of heat or sulphuric acid.

An ingenious memoir, by Mr. Trommer, upon the distinguishing criteria of gum, dextrine, grape sugar, and cane sugar, has been published in the 3d volume of the *Annalen der Chemie und Pharmacie.* I have repeated his experiments, and find them to give correct results, when modified in a certain way. His general plan is to expose the hydrate of copper to the action of solutions of the above mentioned vegetable products. He first renders the solution alkaline, then adds solution of sulphate of copper to it, and either heats the mixture, or leaves it for some time in the cold. By pursuing his directions, I encountered contradictory results; but by the following method, I have secured uniform success in applying the criteria, and have even arrived at a method of determining by a direct test, the quantity of sugar in diabetic urine.

I dissolve a weighed portion of sulphate of copper in a measured quantity of water, and make the solution *faintly* alkaline, as tested with turmeric paper, not litmus, by the addition of potash ley in the cold, for if the mixture be hot, a portion of the disengaged green hydrate of copper is converted into black oxide. This mixture being always agitated before applying it, forms the test liquor. If a few drops of it be introduced into a solution of gum, no change ensues on the hydrate of copper, even at a boiling heat, which shows that a gummate of copper is formed which resists decomposition; but the cupreous mixture, without the gum, is rapidly blackened at the boiling temperature. I do not find that the gummate is redissolved by an excess of water, as Trommer affirms. Starch and tragacanth comport like gum, in which respect I agree with Trommer; starch, however, possesses already a perfect criterion in iodine water. Mr. Trommer says, that solution of dextrine affords a deep blue coloured liquid, without a trace of precipitate; and that when his mixture is heated to 85° C. it deposits red grains of protoxide of copper, soluble in muriatic acid. I think these

phenomena are dependent, in some measure, upon the degree of alkaline excess in the mixture. I find that solution of dextrine treated in my way, hardly changes in the cold, but when heated slightly becomes green, and by brisk boiling an olive tint is produced; it thus betrays its tendency of transition into sugar. Solution of cane sugar, similarly treated, undergoes no change in the cold at the end of two days; and even very little change of colour, even at a boiling heat, if not too concentrated. Cane sugar, treated by Trommer in his way, becomes of a deep blue; it can be boiled with potash, in excess, without any separation of orange red oxide of copper.

Starch, or grape sugar, has a marvellous power of reducing the green hydrate of copper to the orange oxide, but I find it will not act upon the pure blue hydrate even when recently precipitated; it needs the addition in this case also of a small portion of alkali; but ammonia does not seem to serve the purpose, for on using the ammonia sulphate of copper in solution, I obtained unsatisfactory results with the above vegetable products. The black oxide of copper is not affected by being boiled in a solution of starch sugar. "If solution of grape sugar," says Trommer, "and potash be treated with a solution of sulphate of copper, till the separated hydrate is re-dissolved, a precipitate of red oxide will soon take place at common temperature; but it immediately forms, if the mixture is heated. A liquid containing $\frac{1}{100000}$ of grape sugar, even one millionth part," says he, "gives a perceptible tinge (orange) if the light is let fall upon it." To obtain such a minute result, very great nicety must be used in the dose of alkali, which I have found it extremely difficult to hit. With my regulated alkaline mixture, however, I never fail in detecting an exceedingly small portion of starch sugar, even when mixed with Muscovado sugar; and thus an excellent method is afforded of detecting the frauds of the grocers.

I find that manna deoxidizes the green hydrate of copper slowly when heated, but not nearly to the same extent as grape sugar, which reduces it rapidly to the orange oxide.

If an excess of the hydrate of copper test be used, there will be a deposit of green hydrate at the bottom of the vessel.

To apply these researches to the sugar of diabetic urine—This should first be boiled briskly to decompose the urea and to dissipate its elements in the form of ammonia, as well as to concentrate the saccharine matter whereby the test becomes more efficacious. Then add to the boiling urine, in a few drops at a time, a cupreous mixture containing a known quantity of the sulphate of copper, till the mixture assumes a greenish tint, and continue the heat till the colour becomes bright orange. Should it remain

green it is a proof that more hydrate of copper has been introduced than is equivalent to the deoxidizing power of the starch sugar. I have found that one grain of sulphate of copper in solution, supersaturated very slightly with potash, is decomposed with the production of orange protoxide by about three grains of potato sugar; or more exactly thirty parts of the said sulphate, in the state of an alkaline hydrate of copper, pass altogether into the state of orange oxide, by means of 100 parts of granular starch sugar. Thus, for every three grains of sulphate so changed, ten grains of sugar may be estimated to exist in diabetic urine.

Acetate of copper may be used in the above experiments, but it is not so good as the sulphate. The chloride of copper does not answer.

Specific gravity is also an important criterion applied to sugars; that of the cane and beet root is 1.577, not 1.6065 as given by Berzelius and others; that of starch sugar, in crystalline tufts, is 1.39, or perhaps 1.40, as it varies a little with its state of dryness. At 1.342, syrup of the cane contains seventy per cent. of sugar; at the same density syrup of starch sugar contains seventy-five and a half per cent. of concrete matter, dried at 260° (Fahr.), and, therefore, freed from the ten per cent. of water, which it contains in the granular state. Thus, another distinction is obtained between the two sugars in the relative densities of their solutions, at like saccharine contents, per cent.

LECTURE ON VEGETABLE POISONS,

DELIVERED AT THE ESTABLISHMENT OF THE PHARMACEUTICAL SOCIETY, JUNE 22,

BY R. H. SEMPLE, ESQ.

The vegetable kingdom, to which man is largely indebted for the materials of food, clothing, and shelter, produces also some of the most deadly poisons with which science, experience, or accident has made him acquainted. The thin, elastic, and invisible air, the transparent and tasteless waters, and the carbonic acid and other soluble matters dissolved in both, become converted in the minute and mysterious laboratories of the living plant, into a variety of products, some of which prolong and gladden the life of man, and others are able in a few short moments to conduct him headlong to the gates of death. The same complicated apparatus of cellules and tubes, which extracts from the vegetable fluids such valuable products as sugar, starch, gum, and wood, affords under other circumstances, the most destructive and energetic poisons, such as opium and strychnia. Deadly as are many of the mineral poisons, they are yet surpassed in activity and energy by many of the products of vegetation, which operate with a vigour and rapidity which no human power can arrest, and some with a fatality which no antidote hitherto discovered can avert. In examining the poisonous productions of the vegetable kingdom, we find that their properties are generally due to the presence of some acid or alkali contained in the plant from which they are derived. Oil of bitter almonds and cherry laurel water are poisonous, in consequence of containing prussic acid—opium owes its activity to the alkaloid morphia—the upas tieute derives its energetic powers from the alkaloid strychnia—conia is the active principle of hemlock—veratria of hellebore—aconitina of monk's hood; and although there are several poisonous plants in which the active principle has not yet been detected, there can be little doubt that such a principle exists, although it has hitherto eluded the researches of the Chemist.

The chemical relations and constitution of the poisonous agents derived from vegetable bodies, are far more complicated than those obtained from the mineral kingdom. Thus we find that the mineral poisons are generally binary compounds; that is to say, consisting of two elements only; as for instance, nitric acid, which is a compound of nitrogen and oxygen, arsenious acid, or white arsenic, of metallic arsenic and oxygen, and corrosive sublimate, of quicksilver and chlorine; or consisting of

an acid and a base, in a state of combination; as for instance, sugar of lead, which is a compound of acetic acid and oxide of lead, blue vitriol of sulphuric acid and oxide of copper; in all which cases, various elementary substances combine with one another. On the contrary, we find that the vegetable poisons are very seldom binary compounds, but generally consist of three or four elements; but it is very remarkable, that these elements are the same in all, and vary only in the proportions in which they are combined. Thus, hydrocyanic acid is a compound of carbon, hydrogen, and nitrogen; morphia of carbon, hydrogen, oxygen, and nitrogen; and strychnia, veratria, atropia, aconitina, and indeed all the vegetable alkalies, whether poisonous or otherwise, consist of exactly the same elements as morphia, but combined in different proportions.

The following table exhibits the chemical composition of four of the principal alkaloids.

	Carbon	Hydrogen	Oxygen	Nitrogen
Quinia	20	12	2	1
Morphia	34	18	6	1
Veratria	34	22	6	1
Strychnia	30	16	3	1

It is an astonishing and startling fact, yet one which is proved upon the most clear and indisputable evidence, that carbon, the basis of wood; oxygen, the vital principle of atmospheric air; hydrogen, one of the elements of water; and nitrogen, the basis of nitric acid, combine together, under the mysterious influence of vegetation, in one case to form cinchonia and quinia, which often as by magic, restore the fevered patient to the vigour of health; morphia, which soothes the agonies of pain, and lulls the sufferer in oblivious repose; and strychnia, which produces tetanus and death in a few seconds. From the similarity of composition which prevails in the products of vegetation, and from the number of gaseous elements which enter into their construction, it will easily be understood why one may often be converted into another, and some lose their activity from slight causes. Thus sugar is converted into oxalic acid by the addition of aqua fortis; and oxalic acid is wholly resolved into carbonic acid and carbonic oxide, by the action of sulphuric acid; the poisonous principle of the cassava is destroyed by boiling, that of the ranunculi by drying in the open air; while prussic acid is decomposed, and its poisonous principle entirely destroyed by the feeble agency of light.

In order to arrange and methodize our views concerning the poisonous products of the vegetable kingdom, it will be necessary to take a rapid glance at the Natural System, as it is called, of botanical classification. An acquaintance with the general

principles of this celebrated system will be found greatly to facilitate our knowledge of the properties and uses of plants, and to systematize and condense into a small compass, a vast number of apparently isolated facts, which might probably embarrass and perplex the student if considered apart from each other.

To trace the analogies which exist among the various tribes of vegetables scattered over the surface of the globe—to separate the most striking groups into classes and orders, genera and species—to ascertain the connexion between external form and sensible properties; as for instance, what plants contain poisonous or noxious principles, what contain wholesome and nutritious food, or what are destitute of any known activity or virtue, are the objects of the natural system of botany, objects which no artificial system has either aspired to or attained. On the most cursory inspection of the vegetable world, the rudiments of a natural system must be plainly observed, every district of the globe has its peculiar Flora, every inequality on the earth's surface presents a new tribe of vegetable beings; and although the geographical distribution of plants or their particular localities can never be made the basis of a natural classification, yet they may be made to afford many valuable secondary characters. Thus the tribes of Algæ, or sea-weeds, exist only in the depths of the ocean, or lie scattered on the sea shore; various maritime plants, as samphire, sea-poppy, and others, inhabit the coasts or salt marshes, but are never immersed in the waves. The lakes and streams in the interior of islands and continents, are covered with myriads of aquatic plants, which either float upon their surface, or lie hidden beneath their placid waters; the ditches and fens give shelter and nourishment to many peculiar vegetable forms; one tribe of plants flourishes in the rich and verdant meadow, another climbs the sides of the precipitous rock; multitudes of lichens, mosses, and other cryptogamic plants, abound in the vicinity of springs and waterfalls, or cover the trunks of trees, or the sides of houses; while a vast variety of neglected weeds follow the footsteps of man, and flourish among the rubbish which is cast out from towns and villages. One tribe of plants composes the almost impenetrable recesses of woods and forests; another consists of humble weeds lying neglected by the road-side, or taking root in the sands or pebbles of the sea shore. There are some that pass their existence in deep, dark, subterranean caverns, others appear on the highest mountains, near the limits of eternal snow; one becomes a lofty tree, expanding its umbrageous branches over long tracts of ground; another lingers through life a feeble parasite, unable to support itself, and com-

pelled to seek for protection and nourishment from a stronger stem.

The geographical distribution of natural orders is a subject of the deepest interest and importance, and exhibits in a remarkable manner the bounty and beneficence of nature, and the variety of her resources. Thus the gigantic palms, so imposing to the eye, and so useful to mankind, are almost exclusively confined to the burning regions between the tropics: the saxifrages and rosaceous plants are chiefly found in the cold regions of the north; the cacteæ are almost peculiar to America; the camellias, from which tea is obtained, are indigenous to the kingdoms of China and Japan; magnolias are restricted to the southern parts of North America; the tribe of scitamineæ, comprehending ginger and cardamom, are chiefly confined to the East Indies; the seat of the cinchonæ is on the chains of the Andes; the true pines flourish only in countries which are without the tropics; the natural order of bromeliaceæ, containing the pine-apple and the American aloe, abound in America or the islands in its vicinity.

But I must quit this fascinating theme, and proceed to other and more practical subjects.

The circumstance which should ever be held in view as a primary consideration by all who study the natural classification of plants, is the relation which exists between the external and visible forms of vegetables, and the properties which they are found to possess. Thus, by understanding the principles on which the natural system of Botany is founded, the traveller who explores a newly discovered country, will be able to determine, with considerable accuracy, from the outward forms of the plants he meets with, which of them are to be prized as containing valuable medicinal virtues, which are to be selected as articles of food, which are to be avoided as abounding in acrid, irritating, or narcotic principles, and which are to be rejected as useless or inert. A person might be shipwrecked upon a strange coast, and a multitude of fruits and flowers would present themselves to his eye, some of which are probably poisonous, others nutritious; many possessing only negative properties, and none of which the traveller had ever seen before. If acquainted with the principles of botanical classification, he would compare the structure of the unknown plants with those with which he is familiar, or the structure of which he has learned by the aid of books or drawings; and if he discovers similarity in the external forms, he will infer resemblance in properties. Thus he will be enabled to avoid the noxious and useless, and select the edible plants, and may probably be enabled to save the lives of his fellow-travellers.

To take a familiar example, every person is acquainted with the structure of the rose and of the strawberry, the properties of

which are as well known as their external appearance. Now if a person should find a plant with flowers and fruit like a strawberry, he may be convinced that such a plant is innocuous, probably nutritious, and may be eaten with safety; and the same remark may be made of fruits resembling the apple and pear, all of which are nutritious. But if the botanist met with a plant resembling the deadly nightshade in its physical characters, he would at once avoid it, although, perhaps, tempted by gay and beautiful flowers, and pulpy and inviting fruits; for the deadly nightshade, as its name implies, is a virulent poison, and nearly all those plants which have an analogous structure are likewise more or less poisonous, as henbane, thorn-apple and tobacco. The crew of a French vessel, cruising in the Archipelago, found a large quantity of white henbane, or hyoscyamus albus; the plant was boiled and distributed among the whole ship's company, as several of the sailors said they knew it to be eatable and salubrious. But in a short time they were all seized with giddiness, vomiting, convulsions, colic, purging, and delirium. Although they eventually recovered by the adoption of active treatment, the consequences might have been fatal; a botanist would have foreseen the danger, and forbidden the use of such a plant as an article of food.

Among the numerous instances in which certain orders of plants are found to present the same properties throughout a great number of species and genera, the following are some of the most important: The majestic tribe of palms, the nobles of the vegetable kingdom, does not contain a single noxious species, but on the contrary, affords a multitude of products, as oil, wax, flour, cordage, wine, applied in a thousand different ways in the service of man. Papilionaceous flowers, as those of the pea, bean, clover, and vetch, indicate a tribe of plants which are universally wholesome and nutritious, with a single exception, the laburnum: the whole family of the grasses comprehending the sugar-cane, rice, maize, wheat, oat, barley, rye, abounds in a highly nutritious principle, and the order, which is exceedingly large, hardly contains one noxious plant; the rose tribe contains plants which may always be eaten with impunity, and many which yield delicious fruits; the poppy tribe is always to be avoided as containing a narcotic juice resembling opium in its effects: the ranunculaceous tribe contains many species possessing the most virulent and acrid properties, and none of the plants in this order are free from suspicion; the order of cruciferæ is universally wholesome, and abounds in a gently stimulating principle, which renders the plants contained in it highly valuable for the table, as mustard, cress, radish, cabbage, and turnip; the myrtle tribe universally contains a

fragrant, aromatic, volatile oil; the mallow tribe is almost, and the evening primrose tribe altogether inert.

Poisons are divided by modern toxicologists into the irritants, or those which produce local irritation of the tissues to which they are applied; the narcotics, or those which act especially upon the brain and nerves, and the principal effect of which is to cause sleep or stupor; and the narcotico-acrids, in which the narcotic and irritant effects are combined. The irritant poison, oxalic acid, is found in the natural orders, oxalidaceæ and polygonaceæ, though seldom in sufficient quantity to prove deleterious; the narcotic poison, prussic acid, in the kernels and leaves of the almond tribe; acrid principles are found in ranunculaceæ; narcotic and narnotico-acrid principles in solanaceæ; narcotic principles alone in papaveraceæ, particularly in papaver somniferum, which yields the well-known substance, opium.

I propose to devote the rest of this lecture to a consideration of the properties and effects of prussic acid.

Hydrocyanic or *prussic acid*, in its most concentrated state, is perhaps the most deadly poison in existence, as a few drops are sufficient to take away the life of a full-grown man. In a diluted form, however, although still a poison, it is a very useful medicine when cautiously administered, and is hence to be found in all chemists' shops.

Prussic acid occurs in nature in the kernels, leaves, and bark of the almond tribe of plants, comprehending the peach, the plum, the cherry, the cherry-laurel, and many others, all of which agree in certain general characters; they are exogenous plants, generally trees; the flowers consist of a polysepalous calyx, a polypetalous corolla, numerous perigynous stamens, and a single pistil; the fruit is a drupe, consisting of a fleshy envelope, containing a bony case, enclosing a single seed, without albumen, consisting of two seed-lobes. Prussic acid also occurs in a few plants of the apple tribe, as in the mountain ash, and probably in the seeds of the apple and pear, all which plants agree very closely in their botanical characters with the almond tribe, but differ in this respect, viz., the almond tribe has a single seed in each fruit, the apple tribe has five seeds in each.

It is not quite certain whether prussic acid pre-exists in these plants, or is developed by the chemical processes employed; for medicinal purposes prussic acid is always derived from other sources.

In the last edition of the London Pharmacopœia, prussic acid is directed to be prepared in the following manner:—An ounce and a half of sulphuric acid diluted with four ounces of water, is placed in a glass retort, and two ounces of the ferrocyanuret

of potassium dissolved in half a pint of water are added; eight ounces of water are poured into a cooled receiver, and the retort being fitted, a gentle heat is applied by means of a sand-bath, and six fluid ounces are allowed to pass over. Distilled water is then added, so as to reduce the prussic acid to a certain standard of strength, which will be presently explained. The decomposition which takes place in this process cannot well be explained without entering into an explanation of the chemical nature of the double cyanurets, but I hope that the following brief account of the changes produced will be found sufficiently intelligible.

Hydrocyanic acid, as its name implies, is a compound of hydrogen and cyanogen, the latter of which is itself a compound body consisting of carbon and nitrogen. Sulphuric acid is composed of sulphur and oxygen, and prussiate of potash, as it is commonly called, consists of cyanuret of iron and cyanuret of potassium. Now when water and sulphuric acid, aided by heat, act upon the ferrocyanuret of potassium, the following changes ensue: Water is decomposed, its hydrogen combining with the cyanogen of the ferrocyanuret, and forming prussic acid; while the oxygen unites with the iron and potassium of the ferrocyanuret of potassium, forming oxide of iron and potash, both of which unite with the sulphuric acid to form sulphate of oxide of iron, and sulphate of potash. When the prussic acid is to be prepared in haste, the College directs nine grains and a half of cyanide of silver to be mixed with one ounce of distilled water, and nine minims of muriatic acid; the ingredients to be shaken together in a well-stopped bottle, and the clear liquid, which contains the prussic acid, to be poured off. Prussic acid may be prepared in other modes—by heating the bicyanuret of mercury in a retort with muriatic acid, when the results are hydrocyanic acid and corrosive sublimate, or by simply mixing cyanuret of potassium dissolved in water with tartaric acid when the results are hydrocyanic acid and the bitartrate of potash.

In its ordinary state the solution of hydrocyanic acid is limpid and colourless: although an acid, it is a very feeble one, and reddens litmus paper only slightly; it has an acrid pungent taste, and a very peculiar and characteristic odour. If any other acid be mixed with the prussic acid, a red precipitate is formed by the addition of the iodo-cyanide of potassium and mercury. If kept for a considerable time, prussic acid loses its powers, sometimes from evaporation, sometimes from decomposition; by the influence of light it is speedily decomposed, and becomes black, carbon being deposited, and ammonia and water being formed. For this reason prussic acid is directed to be kept in

vessels which are excluded from the light. In consequence of its volatility it becomes weak by frequent exposure to the air; and from this cause, as well as from its facility of decomposition, and the various processes adopted in its preparation, the acid of the shops is very variable in point of strength. The preparations of this acid, as recommended by different authors before the publication of the last edition of the Pharmacopœia, also differed very materially; the solutions containing in some preparations only one part of real acid, in others as much as fifty parts in a hundred. From this diversity in the strength of different articles, serious mistakes have sometimes arisen; thus, a French Physician once made some experiments on the uncertainty of the strength of the medicinal acid, and he found that he could swallow a whole ounce of one sample, and a drachm of a stronger sample, without sustaining any injury; but on trying some which had been recently prepared by Vauquelin, he was immediately taken ill, and narrowly escaped with his life. A few years since, a dreadful case occurred in one of the Parisian hospitals, where a certain quantity of prussic acid was ordered by the physician in attendance, to be given to seven epileptic patients; the quantity ordered was moderate according to the formula intended by the physician, but another preparation was used, and the whole of the patients died in forty-five minutes. To prevent any such dangerous accidents, the London Pharmacopœia orders the acid to be prepared of a certain uniform strength; every hundred grains contain two grains of real acid, and are exactly saturated by 12.7 grains of nitrate of silver, producing ten grains of cyanuret of silver.

The tests of hydrocyanic acid are very characteristic, and are not liable to any fallacy when carefully applied. They are, its odour, the salts of copper, the salts of iron, and nitrate of silver.

1. The odour of prussic acid is exceedingly powerful and characteristic, and will sometimes serve to distinguish the presence of the acid, when it has become too weak for the application of the other tests.

2. The sulphate of copper forms with prussic acid, when rendered alkaline by a little potash, a greenish precipitate, which becomes nearly white on adding a little hydrochloric acid. The last is added to dissolve a little oxide of copper which colours the precipitate.

3. The nitrate of silver throws down, with prussic acid, a white precipitate, the cyanuret of silver, insoluble in nitric acid at ordinary temperatures, but soluble in that acid at its boiling temperature. This test cannot be relied upon, because muriatic acid also gives a white precipitate with nitrate of silver.

4. If a little potash be added to the solution containing prussic acid, the salts of iron produce a greyish green precipitate, which, on the addition of a little sulphuric acid, becomes of a deep Prussian blue colour. The decompositions which ensue, in this case, are rather complicated, but may be briefly explained in the following manner—the potash, added to a salt of iron, throws down the protoxide and peroxide of iron, and these latter decompose and are decomposed by the prussic acid, giving rise to the production of water and Prussian blue. This will be better seen by reference to the following diagram :—

Four parts of Prussic Acid, 4 (H+Cy)
One part of Protoxide of Iron (Fe+O)
One part of Peroxide of Iron (2 Fe+3 O) are resolved into
Four parts of Water, 4 (H+O) and
One part of Protocyanuret of Iron (Fe+Cy) } Prussian Blue.
One part of Percyanuret of Iron (2 Fe+3 Cy }
The Sulphuric Acid is merely added to dissolve any excess of potash.

The salts of iron will act equally well, whether the prussic acid is in a separate state or mixed up with organic substances, as tea, wine, milk, &c. If the body of a person who has been poisoned by prussic acid, is not examined for some days, it is probable that no trace of the acid will be detected, owing to its great volatility. MM. Leuret and Lassaigne, who have made many experiments on the effects of prussic acid, have found that it may be detected two or three days after death, but not after a longer period. The best method to be adopted when the quantity of acid is small, is to place the fluid contents of the stomach in a retort, and distil with a gentle heat; or, if there are no fluid contents, to cut the stomach into small pieces, mix with a little water, introduce them into a retort and distil as before; the prussic acid being volatile soon passes over, and is collected in the receiver, where it may be detected by the usual tests. In this manner Dr. Turner ascertained the presence of the acid in the case of a young man four days after death; but the quantity obtained was very minute, although the odour of prussic acid emitted by the contents of the stomach was very apparent.

The effects of this acid upon the body are more rapid than those of oxalic acid, and are not surpassed, in this respect, by any poison in existence. Dr. Christison, who has made some very valuable experiments on the subject, found that a single drop, weighing scarcely the third of a grain, dropped into the mouth of a rabbit, killed it in eighty-three seconds; that three drops killed a strong cat in thirty seconds; and that twenty-five grains began to act upon a rabbit as soon as it was poured into the mouth, and killed it in ten seconds. The poison is equally efficacious when applied to different exposed parts of the body: thus, three drops, applied to the eye of a cat, killed it in forty

seconds; and the same quantity dropped on a fresh wound in the loins proved fatal in a hundred and five seconds. The vapour of the acid, however, appears to be most instantaneous in its operation; for it has been found, that when a bird, a rabbit, a cat, and two dogs, were made to breathe air saturated with its vapour, the first died in one second, the second also in one second, the cat in two, one dog in five, and the other in ten seconds.

Prussic acid is fatal to all animals indiscriminately: according to M. Coullon, the highest and the lowest tribes in the scale of creation all perish in nearly the same manner, when subject to its influence. It also exerts a fatal influence upon plants. The phenomena observed are, sometimes a change in the colour of the leaves and flowers, and diminished sensibility to external impressions. If a stem of the sensitive plant be immersed in the acid, the leaves lose their irritability. If a seed be plunged in dilute prussic acid, it loses the power of germination. It is poisonous in all its combinations. Hydrocyanate of ammonia has been found to kill a sparrow in two minutes, when given in the dose of two drops: Robiquet and Magendie found that five grains of this substance killed a large pointer in fifteen minutes: Orfila has related a case in which six grains of hydrocyanate of potash caused death in the human subject within an hour.

The symptoms observed in man, when a poisonous dose of prussic acid has been taken, are the following:—The person is seized with insensibility, staggers, and falls down: he utters no cry, and gives vent to no complaint: he does not vomit, nor does he appear convulsed: the pulse is weak and hurried: the limbs gradually become stiff, the eyes appear glazed, the pulse becomes imperceptible, the heart ceases to beat, and death ensues without a struggle in a very short space of time, varying from two to thirty minutes. It is believed, that if the patient survive forty minutes, he will recover. In smaller quantities, it is said by Dr. Christison, to cause convulsions. In quantities which are not adequate to prove fatal, but which produce various unpleasant feelings, the symptoms are nausea, salivation, hurried pulse, weight and pain in the head, and giddiness. These effects have been sometimes observed in cases where prussic acid has been used medicinally, and given in rather too large doses.

Thus it will be perceived, that prussic acid belongs to the class of narcotic poisons, and that its action is on the nervous system. There is no pain or local uneasiness, as in poisoning by arsenic or oxalic acid; its effects are somewhat analogous to those of opium, but its operation is much more rapid, and there is not such a marked disposition to sleep.

The morbid appearances produced by poisoning with prussic acid, are not so remarkable as might be anticipated from the

rapidity and virulence of its action. This poison most unquestionably does not owe its effects to any local injury produced by it upon the animal tissues, but to some influence conveyed to the great centres of vitality by means of the nerves. Thus the principal symptoms are insensibility, or in milder cases, giddiness and confusion of intellect, showing the brain to be affected; afterwards the breathing becomes embarrassed, and the heart ceases to beat, effects probably owing to the palsy of the nerves which influence the motions of the heart, and supply the apparatus of respiration. In the cases which have been published, and in one which I saw myself, it did not appear that the parts to which the prussic acid had been applied, were ulcerated or even inflamed, as in poisoning with irritating substances, as arsenic or corrosive sublimate.

The appearances observed upon examination after death, are, however, worthy of notice. The eyes retain for a considerable period after death, the same glazed appearance which they presented during life after swallowing the poison, the face is placid, and the limbs stiff, but the body is not discoloured. The blood is fluid, instead of being coagulated in the usual manner, it has a dark colour, and a somewhat oily appearance, and exhales strongly the odour of prussic acid. The odour of the acid is to be detected in all parts of the body, provided a sufficiently long period has not elapsed to allow of the evaporation of the acid: the odour may be clearly detected in the stomach, the heart, the lungs, the brain, and throughout the circulation. The different organs of the body, are also found to be turgid and gorged with blood. Except the odour of the acid, which may disappear in a few days, and the presence of the acid itself, as detected by the processes already described, I know of no means of determining with certainty, by *post-mortem* examination, the fact of poisoning with prussic acid.

I shall now offer some observations upon the treatment of poisoning by prussic acid; and here I would observe, that this part of the subject ought to be well understood by those whom I now address, because such is the rapidity of its operation, that life may be lost before medical advice can be procured; while a judicious application of remedial measures, immediately adopted, may frequently avert its fatal effects. I think I may say with confidence that no antidote, properly so called, exists against prussic acid, and our hopes of success must depend upon the establishment in the system of effects the reverse of those caused by the acid. It has already been observed, that all the chemical compounds of prussic acid, so far as they have been examined, are equally poisonous with the acid itself, and no success is, therefore, to be anticipated from the administration of alkalies or me-

tallic oxides. Emetics are of very little service, because in a few seconds after it has been swallowed, the poison is absorbed into the system, and the evacuation of the stomach cannot be attended with any beneficial result; for the same reason the stomach-pump is wholly inapplicable in this species of poisoning. The only remedies which seem to promise any advantage are the powerful stimulants, or those which produce a sudden and marked effect upon the system. Three most valuable agents in poisoning by prussic acid are ammonia, chlorine, and cold affusion.

1st. Ammonia is considered a very valuable remedy in cases of poisoning by prussic acid; it does not, however, act by neutralizing the acid, for the hydrocyanate of ammonia is as poisonous as prussic acid, but by powerfully stimulating the system, and thus counteracting the sedative effects of the poison. Various experiments have been made with this substance in the case of animals poisoned by prussic acid; and although it cannot be considered an antidote, yet it appears that when the quantity of poison administered is small, and the ammonia given immediately afterwards, beneficial effects have ensued. Orfila thinks that solution of ammonia is of no service when taken into the stomach; but that if the vapour of it be inhaled, life may sometimes be preserved, provided the dose of the poison be not large enough to act with great rapidity. In the application of this remedy, care should be taken not to employ too strong a solution of ammonia, because that substance is itself an irritant poison. A French physician suffered ulceration of the mouth and violent pulmonary catarrh, in consequence of the excessive use of ammonia, given to relieve the effects of prussic acid.

2d. Chlorine is said to be a more powerful agent than ammonia in poisoning by prussic acid, and its efficacy appears to depend upon the same cause, namely, its stimulating properties. Orfila states, that this is the most powerful remedy hitherto proposed, and that animals which have taken a dose of poison sufficient to kill them in fifteen or eighteen minutes, will be saved by inspiring water impregnated with a fourth part of its volume of chlorine. As chlorine gas, or a solution of chlorine is not always ready, the solution of chloride of lime or of chloride of soda may be used instead. Care must be taken not to use an excess of chlorine, as that substance, like ammonia, is a powerful irritant.

3d. The cold affusion was first recommended by Dr. Herbst, of Göttingen, and depends for its efficacy on the sudden shock which it produces upon the system. The most decisive experiment made by this author was the following: Two dogs of equal size were selected, and a poisonous dose of prussic acid was given to one, which died; the same dose was then given

to the other dog, and after distinct symptoms of poisoning had appeared, the cold affusion was resorted to, a gradual amendment took place, and the animal eventually recovered.

Dr. Pereira also strongly recommends the practice of artificial respiration in poisoning by prussic acid, and states his conviction of its efficacy by repeated experiments on animals.

Hydrocyanic acid exists in some plants, which are poisonous in consequence of its presence. These plants are the bitter almond, cherry-laurel, bird-cherry, and peach, to which may be added the mountain-ash. The poison procured from them exists in two forms—as a distilled water and as an essential oil. Both contain prussic acid, as is shown by the blue precipitate which they give with potash and acidulated sulphate of iron. They have a powerful, peculiar, and grateful odour, which is usually likened to that of pure prussic acid, but the smell really bears little resemblance to that of prussic acid, and is not owing to its presence.

Oil of bitter almonds is a most deadly poison in large doses; it was once extensively used in medicine, and is still very frequently employed by confectioners and others for flavouring custards, puddings, liqueurs, and sweetmeats. The bitter almond is the kernel of the amygdalus communis, a tree which is indigenous to Barbary, and is extensively cultivated both in the temperate parts of Europe and in Asia. It is well known in our gardens, and is distinguished by bearing its flowers before any of the leaves are produced, a circumstance which has been happily alluded to by Thomas Moore in "Lalla Rookh"—

> "The hope, in dreams, of a happier hour
> That alights on Misery's brow,
> Springs out of the silvery almond-flower
> That blooms on a leafless bough."

The sweet and the bitter almond are derived from the same species, and no botanical difference is found to exist between them, although they differ so widely in their taste and other properties. They are in fact only *varieties* of the same *species:* the two plants are said to be convertible into each other—the sweet variety becoming bitter by neglect; the bitter becoming sweet by cultivation; and the seed of either variety producing plants of both. I do not, however, vouch for the accuracy of this statement.

When the bitter almonds are subjected to pressure, they yield a sweet oil, altogether analogous to that produced by sweet almonds; but when the cake of bitter almonds is mixed with water and subjected to the action of heat, a volatile oil passes over of a very peculiar nature, which is the true oil of bitter almonds. This oil does not appear to exist ready formed in the

bitter almond, but is produced only when the almond pulp comes in contact with water; for it cannot be separated by any process whatever from the almond, without the co-operation of water. The presence of prussic acid in this oil may be proved by dissolving it with agitation in water, and treating the solution with caustic potash, followed by sulphate of iron and sulphuric acid.

The bitter almond acts upon the animal system in the same way as hydrocyanic acid, but it likewise excites at times signs of irritation. The symptoms it produces in animals are trembling, weakness, palsy, and finally stupefaction. Orfila states, that twenty bitter almonds will kill a dog in six hours, if the gullet is tied to prevent vomiting; but if vomiting be allowed, the animal will recover. He also found that six bitter almonds in coarse powder applied to a wound in the thigh of a middle-sized dog caused death in four days. This oil is hardly inferior in activity to prussic acid. A single drop of it applied by Sir Benjamin Brodie on the tongue of a cat, caused violent convulsions and death in five minutes. But if this oil be entirely freed from prussic acid, it is not more poisonous than other essential oils, though it still retains its characteristic and grateful flavour. As the oil of bitter almonds is very extensively employed in flavouring articles of confectionery, a German writer suggests the propriety of removing the prussic acid from the oil by repeated distillation with caustic potash, which removes the poisonous ingredient, but does not at all injure its other properties.

As the symptoms produced, and the morbid appearances observed in poisoning with oil of bitter almonds are closely analogous to those produced by prussic acid, it will be unnecessary to repeat them; and I shall only observe that its effects are almost as powerful, and its deadly energy almost as rapid as prussic acid itself; and that, as in the case of the acid, no antidote to its operation has hitherto been discovered; nor can it be said that any mode of treatment has yet proved uniformly successful; for such is the rapidity of the effects of the poison, that fatal symptoms too often supervene before medical assistance can be obtained.

The leaves of the cherry-laurel or prunus lauro-cerasus have long been known as affording a distilled water, which possesses highly poisonous properties, but which, in small quantities, was formerly employed for flavouring liqueurs and sweetmeats. It was also used in medicine, but it has now been altogether superseded by the prussic acid itself. Although called the cherry laurel, this plant really belongs to the almond tribe, as is evident from the structure of its flowers and fruit. It is commonly cultivated in our gardens, and is distinguished by its

thick, smooth, evergreen leaves, and its clusters of beautiful white flowers. Almost every part of this plant is poisonous, especially the leaves and kernels; but the pulp of the fruit is not. It yields an essential oil, analogous in its properties to oil of bitter almonds, and a distilled water, which is much better known. It is found by experiment that when cherry-laurel water is introduced into the animal system, either by the stomach, by a wound, or into a vein, it occasions giddiness, palsy, insensibility, convulsions, and death.

A very remarkable trial took place during the last century, of a Captain Donellan, who was supposed to have caused the death of Sir Theodosius Boughton, by administering the distilled cherry-laurel water. It appeared that Sir T. was a young gentleman who was to come into possession of a large property on arriving at the age of twenty-one; but in the event of his not attaining to that age, the property was to descend to his sister, who was married to Captain Donellan. Sir T. was labouring under a slight illness, for which he was taking medicine. One morning his mother gave him a draught, which he noticed at the time to be very nauseous, and which seemed to his mother to smell very strongly of bitter almonds. In about two minutes he experienced various unpleasant symptoms, which lasted for about ten minutes, when Lady Boughton left the room. On returning in about five minutes, she found him with his eyes fixed upwards, his teeth clenched, and froth running out of his mouth, and he died in about half an hour. Captain Donellan came into the room when Sir T. was dying, and inquiring where the physic bottle was, he took it, poured away its contents, and washed it, notwithstanding the remonstrances of Lady Boughton. It was also proved that Captain Donellan kept a still. Various medical gentlemen gave their evidence upon the trial, and four or five of them distinctly attributed the death of the deceased to the effects of the cherry-laurel water; but the celebrated John Hunter had paid so little attention to the operation of poisons, that he gave dubious and evasive answers upon this occasion, and his conduct was severely commented upon by the judge. Captain Donellan was found guilty and executed, although the evidence was altogether circumstantial.

I have thus briefly brought before your notice, some of the leading particulars connected with the nature and properties of prussic acid, one of the most energetic and destructive poisons which the ingenuity of man has ever invented, a poison which in a few moments pervades every organ and tissue of the body, dries up the fountains of life, and hurries its unhappy victim by a rapid, but perhaps painless transition, to the world of spirits.

No reckoning made, but sent to his account
With all his imperfections on his head."

		Presented by
The Pharmacopœia of France, by Charras	1678	Mr. Ince
Pharmacopœia Londinensis	1724	Mr. John Hobson
Pharmacopœia Suecica	1787	Mr. Ince
Healde's Translation of London Pharmacopœia, by Latham	1801	Mr. John Caparn (Newark)
Principia Botanica	1787	
Nisbet's Dictionary of Chemistry	1806	
Wilson's Chemistry	1721	
Campbell's Translation of the Pharmacopœia Londinensis	1809	Mr. Thomas Pollock (129, Fenchurch-street)
Graves' Conspectus of the Pharmacopœias	1810	
Higgins's Comparative View of the Phlogistic and Antiphlogistic Theories	1789	
Higgins's Experiments	1786	
Berthollet on Chemical Affinity, by Farrell	1804	
Chamberlaine's Tirocinium Medicum	1812	
Black's Experiments on Magnesia, &c.	1777	
Pemberton's Dispensatory	1746	
Magendie's Formulary, by Gully	1836	Mr. J. S. Lescher
Application of Galvanism to Medical Purposes, by Aldini	1819	
Cullen's Materia Medica, 2 vols.	1789	Mr. Orridge (Deptford)
Boerhaave's Chemistry, by Dallowe, 2 vols.	1735	
Lewis's Materia Medica, by Dr. Aikin	1791	Mr. Manthorpe
Ure's Dictionary of Chemistry	1824	Mr. E. J. Hulm
Dr. D. B. Reid's Elements of Chemistry	1839	Mr. Grace (Grafton-st.)
Smith's Compendium Floræ Britannicæ	1828	
The Hermetical Triumph	1723	
Readings in Science	1833	
Smith's Complete Body of Distilling	1725	
The Tomb of Semiramis hermetically Sealed	1674	
The Journal de Pharmacie, for	1837	
Henry's Epitome of Chemistry	1803	Mr. Ince
The Works of Glauber, by Packe	1689	
Medical and Pharmaceutical Tracts	1768-87	
Butler on Kink-Cough	1773	
Shaw's Practice of Physic	1730	
Jones on Opium	1700	
Mead on Poisons	1702	Mr. Hambrook (Dover)
The Art of Distillation		
Ortus Sanitatis	1517	Mr. Mackinlay
Magendie's Formulary	1835	Mr. Fredk. John Bell
Bachhoffner's Chemistry of the Fine Arts	1837	
Mitscherlich's Chemistry, adapted to Arts and Manufactures, by Hammick	1838	
Davy's Agricultural Chemistry	1839	
Whewell's Philosophy of the Inductive Sciences, 2 vols.	1840	
Davy's Physiological Researches, 2 vols.	1839	
Brande's Tables of Chemical Equivalents	1828	
Rees on the Analysis of the Blood		
Berzelius's Analysis of Inorganic Bodies, by Rees	1833	
Addison and Morgan on Poisons	1829	
Transactions and Proceedings of London Electrical Society	from 1837 to 1840	The London Electrical Society
Proceedings of London Electrical Society, Session 1841-2, Parts 1, 2, 3, 4		
Lindley's Introduction to Botany	1839	Mr. Deane (Clapham)

The Library is now assuming a creditable aspect, it contains upwards of three hundred volumes, comprising a good collection of Pharmacopœias, and some of the best works on Chemistry and Pharmacy, both ancient and modern. The greater part of the above have been presented by Members and Patrons of the Institution; but the Council have thought it right to purchase a few of the most standard modern works, which appeared indispensable, but which had not been received as donations.

The steady influx of books continues, as will appear from the above list, and the zeal which has been manifested in furthering this important branch of the Institution, has tended to confirm the favourable anticipations which we expressed, with regard to our future Library.

Two glass cases having been erected in the Museum, arrangements are in progress for the display of those specimens which have already been received, and of which we shall be prepared to give an account in our next number.

PROVINCIAL TRANSACTIONS.

The following paper was read at a meeting of the Members of the Pharmaceutical Society, at Bath, on Tuesday, June 21:

OBSERVATIONS ON THE POWERFUL EXPLOSIVE EFFECTS OF FULMINATING MERCURY, NOW EXTENSIVELY EMPLOYED AS A PRIMING FOR GUNS, &c.

BY DR. WILKINSON, BATH.

The melancholy results of the late explosion of a large mass of this mercurial preparation, occasioning the death of the highly esteemed superintendent of the extensive chemical department established at the Apothecaries' Hall, has caused great excitement, particularly amongst professional gentlemen, who either directly or indirectly were acquainted with Mr. Hennell. With him I had frequent interviews and correspondences, in consequence of being appointed to grant certificates relative to chemistry in this district, to such students as had acquired an adequate knowledge of the science. Upon this occasion I am more particularly induced to submit to the public some circumstances which occurred within a few days after the discovery of the detonating compound.

In the period between 1797 and 1800, I had the pleasure of being acquainted with Mr. E. Howard, brother to the late Duke of Norfolk, who was very partial to chemical pursuits. In the year 1799, he discovered this fulminating mercurial compound; and being desirous of ascertaining whether explosion would take place by the electric spark, he brought about one ounce to my residence, then in London, in company with our joint friend Mr. Abernethy.

Not having at that time my electric apparatus in proper action,

it was agreed to defer the trial to another day, and at the time appointed Mr. Howard attended; and most fortunately during the interval he had ascertained its powerful effects, viz., that eleven grains being introduced into a strong rifle-barrelled pistol, the metal a quarter of an inch thick, was rent and broken into two pieces; two grains were introduced into a key, secured in a strong vice, which was also rent; and, in both instances, with a very powerful report. Had the intended experiment been tried with the proportion brought, the results would most probably have been fatal to Mr. Abernethy, Mr. Howard, and myself, as the quantity intended for trial amounted to 500 grains.

Mr. H. presented me with the shattered remains of the pistol-barrel and keys, and which are at present in my possession.

We have a variety of fulminating powders, the effects of which are to be principally referred to the periods required for the explosion, some rushing instantly into an expanded state, by the slightest action, whilst others proceed comparatively gradually. The oldest fulminating powder known, is that formed by three parts of nitrate of potash, one part of sulphur, and two of carbonate of potash, well mixed together. This requires the temperature of heated iron just below redness, and then violently explodes with a greater report than gunpowder, which consists of five parts nitrate of potash, one part sulphur, and one part powdered charcoal, and in almost every instance its explosion is gradual. In the usual charge of a gun, it was ascertained by Count Rumford, that more than one-half the powder is expelled unchanged, by the exploded action of the first portion contiguous to the touch-hole, and hence the reason that when a cannon has been heated by repeated firing, less subsequent charges are necessary. A few years after Berthollet had discovered the chlorate of potash, it was contemplated that a superior gunpowder would be produced by substituting this for nitre, ground with coal and sulphur.

The experiment was made on a large scale, at the French establishment at Essone, October, 1788, and the result was a dreadful explosion, fatal to a great number of workmen employed.

Fourcroy and Vauquelin have demonstrated the violent detonating effects resulting from concussion with compounds of ammonia with the oxide of silver, or with the terchloride of gold, the results of the latter were ascertained by Dumas to be metallic gold, oxygen, chlorine, hydrogen, and nitrogen.

The fulminating force will be measured by the quantity of gaseous and vaporific matter, combined with the celerity of action in every atom. Thus a cubic inch of gunpowder resolved into its gaseous elements, would with its acquired caloric, occupy more than a thousand cubic inches of space, and if as instantaneous as fulminating gold, silver, mercury, or platinum, would be terrific in expansive power.

INDIGENOUS PLANTS,

THE ROOTS, RHIZOMES, CORMI, LEAVES OR FLOWERS OF WHICH MAY BE GATHERED IN JULY,

ARRANGED ACCORDING TO THE NATURAL ORDERS.

RANUNCULACEÆ.—Aconitum *napellus*. Aconite, Monk's-hood. This plant, although it is not that regarded as officinal, yet possesses all the medicinal properties of the officinal species. The root as well as the leaves are used, the whole plant, therefore, should be gathered. The stem is simple, the leaves are divided nearly to the footstalk into five wedge-shape lobes, each of which is trifid, deep green on the upper, pale on the under side. The flowers are deep purplish-blue, hairy, and the helmet semicircular, and ending in a point. For making extract the juice should be expressed as soon as possible after the plant is gathered.

Ranunculus *acris* and *flammula*. Both of these plants are retained in the Dublin Pharmacopœia; but, as they lose their acrimony by drying and are of little value when recent, we need not describe their characters.

PAPAVERACEÆ.—Papaver *rhœas*. Corn Poppy. In collecting this very common and abundant plant, it is necessary to see that the stem is covered with rough hairs, which stand at a right angle from it; and that the lobes of the pinnatifid leaves are elongated, toothed, and acute. This poppy should be collected in warm sunny days, and the petals quickly dried. The petals only are employed for making syrup.

Papaver *somniferum*. As this poppy is cultivated, and the capsules only are used in this country, it is unnecessary to describe the plant; but we are anxious to impress upon the attention of those who cultivate it, and also upon the trade, that the capsule loses much of its narcotic proper juice when it is permitted to ripen; it should, therefore, be gathered before it has attained its full size, and whilst it is still succulent. The seeds are inert.

UMBELLIFERÆ.—Conium *maculatum*. Hemlock. The great similarity of umbelliferous plants renders hemlock easily adulterated in the recent state. The leaves are large, of a deep-bright green on the upper surface, pale beneath. The footstalk is dilated and embraces the stem, which is smooth, furrowed, and covered with dull purplish blotches; but it is not swollen at the joints. The leaves are triply pinnated, the leaflets pinnatifid. The umbels are many-rayed, and smooth, with the leaflets of the involucrum ovate, sharp pointed, and membranous at the edges. The fruit is plano-convex with five undulated ridges on its convexity. These characters enable us readily to distinguish the leaves of Conium from those of *Œnanthe crocata*, *Cicuta virosa*, *Myrrhis temulenta*, and *odorata*, *Æthusa cynapium*, and *Anthriscus*

vulgaris, with some one or other of which it is often mixed. It is a mistake to suppose that the fresh leaves, when bruised, have the odour of mice; but this smell is instantly developed when they are rubbed in a mortar with liquor potassæ.

Brassicaceæ or Cruciferæ.—Sinapis *nigra*. As the plant is always cultivated for the sake of the seeds, it is unnecessary to describe it.

Silenaceæ.—Saponaria *officinalis*. An extract is said to be still made of this plant, but it is never ordered by the regular professional man.

Rosaceæ.—Potentilla *tormentilla*. Tormentil. Common on dry hilly pastures. The root-stock, which is the part employed, should be gathered by the herb collectors with the plant attached to it. It is a knob, about an inch and a half long, and an inch thick, irregular on its surface, dark brown externally, and internally flesh red. The leaves, which are sessile, consist of three oblong, acute, deeply serrated, somewhat hairy leaflets. The flowers are bright yellow, on slender hairy stalks, with the parts of the calyx and the corolla in fours.

Rosa *centifolia*. Damask Rose. This is always cultivated. The petals should be taken when the flower is half blown, and gathered in dry sunny weather. When they cannot be immediately distilled, they should be salted.

Leguminosæ.—Spartium, *or* Cystisus *scoparium*. Broom. Indigenous. The green tops are the parts employed. They are readily known by the angular, dark green, smooth stem, scattered over with small, ternate, stalked leaves, composed of obovate, obtuse, entire leaflets, silky in their young state. They should be used fresh, if they can be procured, for making the extract.

Polygonaceæ.—Rumex *obtusifolius*. Broad-leaved dock. Although not officinal, yet this the most common is one of the most active of the docks, and is occasionally ordered. The root is many headed, and internally yellow. The leaves are large, stalked, deep green, veiny, cordate, blunt at the apex, crenate and crisped on the margin. The flowers are in long clusters, composed of numerous many-flowered whorls, the lower ones distant and leafy; the root is the part employed.

Rumex *acetosella*. Sheep's sorrel. It is now scarcely or never used.

Caprifoliaceæ.—Sambucus *nigra*. Is now in flower: the flowers are officinal, and are distinguished by being in large smooth cymes, cream coloured, and having a sweetish, heavy odour. They should be gathered in dry sunny weather, and distilled as soon as possible after they are gathered.

Asteraceæ.—Artemisia *absinthium*. Wormwood. Common on waste ground. This herb is known from the other indigenous species, by the close silky hoariness of the entire plant. The

leaves are alternate, doubly pinnatifid, with blunt entire segments, green on the upper disk. The lower leaves are on long footstalks, the upper on short broad and winged petioles. The twigs should be collected before the flowers run to seed. The flowers and upper twigs are odorous, aromatic, and bitter; the lower, or woody parts of the stem, are odorous and aromatic, but not bitter; the former, therefore, only should be collected.

Labiatæ.—Lavandula *vera*. Always cultivated.

Mentha *viridis*—*Piperita*—*Pulegium* are cultivated for medicinal use.

Marrubium *vulgare*. Common in hedge rows. The stem is quadrangular, leafy, covered with fine woolly hairs. The leaves are on longish stalks, wrinkled and veiny. The flowers are white, in dense whorls; the teeth of the calyx rigid, recurved, spreading, the five alternate teeth being smaller than the others. The whole herb is hoary, has an unpleasant aromatic flavour, and a very bitter taste.

Scrophulariaceæ.—Digitalis *purpurea*. Foxglove is abundant on sandy and chalky soils, and in moist situations. Its leaves are alternate, ovato-oblong, crenate, veiny, downy and velvety to the touch, of a dull green colour, and tapering at the base into winged footstalks. They are from six to ten inches long, gradually diminishing in size from the bottom of the stem upwards. Foxglove is a biennial plant, and its leaves possess little activity in the first year of their growth, when they apparently rise from the root. The leaves should not be collected until the plant is fully in flower. They are sometimes adulterated or mixed with the leaves of Symphytum *officinale*, Comfrey, which, however, are easily distinguished by their wavy disk and rough edge; and also with those of Verbascum *thapsus*, Great Mullein, which are densely covered with white, branched, woolly hairs. In drying digitalis, the leaves should be freed from the mid-rib and footstalk.

Solanaceæ.—Hyoscyamus *Niger*. Henbane is found on waste grounds. It is a biennial plant, and possesses little or no activity in the first year of its growth; but the leaves may be collected at any time before the plant seeds, or, indeed at any time in the second year. The leaves are sessile, clasping, decurrent, oblong, acute, unequally slashed, pale dull green, covered with long glandular hairs, which make them feel soft and clammy. The flowers are axillary, among the floral leaves, of a funnel-shape, the corolla of a dingy yellow, beautifully reticulated with purple veins. The whole herb has a peculiar unpleasant odour. The leaves should be quickly dried, and never kept longer than one year.

Atropa *Belladonna*. Dwale, deadly nightshade, is found in waste places. The root is perennial, the plant annual. It is

now in flower, and in the best state for medicinal use. No plant is so easily recognised by its botanical characters, yet other plants are often substituted for it, by the herb collectors. The stem is herbaceous, green with a tint of red, round, slightly hairy below, but smooth above, branching in forks and leafy. The leaves are alternate, in pairs, one generally smaller than the other, ovate, acuminate from three to six inches long, entire, thin, soft, and short stalked. The flowers are axillary, solitary, pendant, bell shaped, of a lurid or dingy purple above, and greenish below. The calyx is persistent, and bears the fruit, which is an ovate, black, shining, bilocular, many-seeded berry-like capsule, or pyxis, containing a sweetish pulp. If the root be used, it should be taken up in spring.

Datura *stramonium.* Stramonium is naturalized, but not indigenous. It is found in waste places ; is an annual plant, rising two or three feet high, with a forked, spreading, leafy stem. The leaves are ovate, smooth, variously sinnuted and toothed, of a light dull-green hue ; the flowers are axillary and solitary, situated in the forks ; trumpet-shaped, about three inches long ; the fruit is prickly, the size of a walnut, and full of dark-brown reniform seeds. The leaves should be gathered when the plant is in flower : the whole plant is officinal. It exhales a peculiar heavy odour. It is easily dried.

Gentianaceæ.—Menyanthis *trifoliata.* Buckbean, Marsh Trifoil. It is common on boggy or moist spongy soils. The leaves, which proceed from the rhizome, are supported on long footstalks furnished with broad sheathing stipules ; they are trifoliate, the leaflets being nearly oval, smooth, somewhat fleshy, with irregularly marked but nearly entire margins. The footstalks are usually gathered with the rest of the leaf, which is inodorous, but aromatic and bitter to the taste. They are easily recognized, and are seldom adulterated.

Melanthaceæ.—Colchicum *autumnale.* Meadow Saffron. The cormus is now in its most perfect state ; being large, plump, and firm, and bearing the young cormus in its rudimentary state ; the last year's being now withered to a shrivelled shell, and separated from that of the present year. As soon as the cormi are dug up, they should be sliced transversely, and the slices dried separately on bibulous paper, at a temperature under 150°. The slices, when well dried, should be of a greyish white colour, and should become blue, when softened with distilled vinegar, and then touched with the spirituous tincture of guaiacum. Their acrimony should not be lessened by the drying. When the cormus is to be preserved entire, the brownish-black tegument should not be removed.

Liliaceæ.—Allium *sativum.* Garlic is generally cultivated, and the bulbs preserved in the aggregate, within the silvery skin which invests the whole.

PREPARATION OF CALOMEL.

BY M. SOUBEIRAN.

In France and in England medical men almost exclusively employ calomel prepared with steam; it is found to be more active and more certain in its effects. The mode of preparation generally adopted is that of Joseph Jewel, with the modifications made by M. Ossian Henry. It consists in conducting steam, together with the vapour of calomel, into a large receiver. The manufacturing Chemists in France follow this process: I have adopted it for many years at the *Pharmacie Centrale;* but am far from being satisfied with it. The operation is difficult to conduct; it requires great expertness of manipulation, and too frequently is attended with accidents, which cause the loss of a great part of the product. Moreover, it must be admitted, that the calomel prepared with steam in France is neither so white nor so finely divided as that which is sent from England.

I have now to present, for communication to the Academy, a mode of preparation very superior to any other that is known to us. I would not occupy the attention of the learned Academy with a simple manufacturing process, if it was not one of a peculiar character, being applied to a product, in the preparation of which we have been unable, up to the present day, to compete with the English manufacturer.

For the vapour of water which is interposed between the particles of the vapour of calomel, and which prevents them from uniting, I substitute a current of air, which, passing over the heated calomel, enters the vapour as it forms, and causes it to condense in a subtle powder.* For this purpose, I heat the calomel in an earthen tube, passing through a furnace, and direct a constant current of air through the interior of the tube, by means of a small blower, so as to carry the vapour into a receiver. If the operation be conducted with a straight tube, a part of the calomel might be carried to a distance of more than twenty yards. To obviate this inconvenience, I cause the end of the tube to dip into water, and the calomel is thus wetted and precipitated in fine powder. This kind of termination to the apparatus is all that can be desired. It only remains for me to perfect the process by ascertaining the best form and material for the vessels in which the calomel is heated. I have not been able to meet with such, ready made, as combine the essential conditions, so that I am obliged to defer to another time the complete description of the process; but I may observe, that even my first attempts at the operation have proved quite successful.

I think the same principle of operation may be applied to the division of other volatile bodies.—*Comptes Rendus.*

* Dr. Christison alludes to an analogous process in his Dispensatory which he gives on the authority of Mr. Dann, of Stuttgardt, p. 525.—Ed.

ON THE METALLIC ACIDS.

BY M. E. FREMY.

(*Extracted by the Author from a Memoir presented to the Academy of Sciences.*)

In submitting the metallic acids to a general examination, I have found some new combinations of metals with oxygen; and new salts, remarkable for their beautiful crystalline forms. The metallic acids may be divided into two classes: in the first are placed those which result from the immediate combination of metals with oxygen, and which dissolve in the cold in alkalies; in the second, the acids which are formed when a metallic oxide is exposed to the simultaneous influence of an alkali and of an oxidizing body.

The metallic acids, which are produced by these two means, present in their properties essential differences. The first are in general stable, and with bases may be formed into well defined and crystallizable salts; the second, on the contrary, are easily decomposed, and lose a part of their oxygen under feeble influences.

To give an example of the first class of acids I have chosen the last combination of tin with oxygen, which has received the name of *stannic acid;* and to characterise the second class of acids, I have studied a new combination of iron with oxygen, which I have named *ferric acid.* In taking, for examples, the metallic acids belonging to important metals, I have intended to indicate the existence of similar combinations among the metals less known.

I have commenced with the examination of ferric acid. I have given a detailed account, in my memoir, of the different means which I have employed to prepare the ferrates. The combinations of ferric acid with bases may be obtained either in the dry or in the humid way. The dry way consists in calcining the peroxide of potassium with sesquioxide of iron in a vessel which will exercise no action on the ferrate. The means by which the ferrate of potash may be most easily obtained in the dry way, is to throw nitre, dried and reduced to powder, on iron filings, previously made red hot; five parts of iron and ten of nitre should be used. A red mass is thus obtained, which contains a large quantity of ferrate of potash. I have prepared the ferrate of potash in the humid way, by availing myself of the result of M. Berthier's experiments on the action which chlorine exercises on the metallic oxides. It is by passing chlorine through a very concentrated solution of potash, holding the hydrate of peroxide of iron in suspension, that I produce the ferrate of potash by the humid way. I enter, at this part, into some details on the action

of chlorine on strong solutions of potash, showing, that in this case there is not formed, as is generally believed, chlorate of potash and chloride of potassium, but a particular combination to which I have given the name *potasse chlorée*, which has the property of decomposing, at a slight elevation of temperature, into chloride of potassium, oxygen, and potash. It is this body, which reacting upon the hydrate of peroxide of iron, transforms it into ferrate of potash. In my memoir, I insist upon the part which the chlorated potash is capable of acting in the production of new combinations of metallic acids with the bases. I cite some applications, and prove, for example, that the oxide of copper is transformed under the influence of chlorated potash, into a combination of potash with a new metallic acid, which I have named *cupric acid.*

It has not, in other respects, been my object to study very particularly the action of chlorine on the alkalies, this question appearing to belong more properly to those Chemists who have recently published so much interesting matter upon this branch of science.

I next pass to the examination of the properties of the ferrates; I prove that heat, the presence of organic substances, or bodies in a state of division, are capable of decomposing the ferrates, and I compare these reactions with those which take place in peroxide of hydrogen under similar circumstances. The composition of ferric acid is represented by the formula $Fe\,O_3$; this acid may be classed, therefore, with the *chromic*, *manganic*, *sulphuric*, *&c.* I show by analysis that the ferrates, obtained by the dry and by the humid way, have precisely the same composition, but the former are generally mixed with nitrite of potash, which, at the moment of the decomposition of the ferrate, absorbs a portion of oxygen, and is transformed into nitrate.

Finally, I describe all the experiments I have made, with the view of producing either an acid with a larger proportion of oxygen than the ferric acid, or an oxide corresponding with the peroxide of manganese; I then allude to the action exercised by the binoxide of barium on the sesquioxide of iron, and show that in this case there appears to be formed a combination of iron and oxygen intermediate between the sesquioxide of iron and the ferric acid. Such are the different questions which I have treated of in the first part of my memoir. The second part is devoted to the examination of *Stannic acid.*

I commence by reviewing what has been published respecting this acid, and allude especially to the remarkable researches of Berzelius, and the observations of Gay Lussac with reference to these. I allude also to a note by Mr. Graham, inserted in Liebig's journal, to explain the modification of stannic acid

which Berzelius had pointed out. The first experiments which I made with reference to stannic acid were for the purpose of ascertaining what part it plays in its combinations. The opinion of Chemists is still divided on these points: should stannic acid be considered as an acid or as a base? or may it alternately play the part of an acid and of a base? These are the questions which I have examined.

All the experiments to which I have submitted stannic acid, have shown that it cannot in any case be considered as a base. When it is eliminated, for example, from chloride of tin by decomposing this substance with an insoluble carbonate, an acid is precipitated which presents well developed acid properties, and which even in this state reddens turnsole. The chloride of tin treated with carbonate of potash does not afford a precipitate of stannic acid, but a stannate of potash, which in this case is insoluble. In examining the combinations of stannic acid with the acids, I prove that they ought not to be considered as salts of peroxide of tin, but rather as combinations of stannic acid with the acids; it is known that many examples are afforded in chemistry of combinations of acids, forming double acids. Finally, I advert to the researches of Chevreul, which are conclusive. M. Chevreul has proved that stannic acid placed in contact with the colouring matter of logwood, comports itself as an acid, while the metallic oxides, properly speaking, and the protoxide of tin itself, comport themselves as bases. The last degree of combination of tin with oxygen should therefore always be considered as an acid.

After the examination of this first point in the history of stannic acid, I pass to the consideration of the properties of this acid. The first experiments which I describe, are intended to elucidate the cause of the modifications presented in stannic acid. This question, which applies to other metallic acids, and which gave rise to the investigations of Berzelius, is one, which from its generality, it is important to be able to resolve.

My experiments show that the two modifications of stannic acid constitute distinct acids, to which I have given different names. I have reserved to the acid which is produced by nitric acid, the name of *stannic acid*, and have named that which is eliminated from chloride of tin, *metastannic acid*.

In determining comparatively the quantities of water contained in these two isolated acids, I have ascertained that the metastannic acid is more hydrated than the stannic acid. As these two acids differ only in the proportions of water which they contain, it will be seen that by a gentle desiccation the metastannic acid may be transformed into the stannic acid. Applying to these acids the ingenious ideas of Graham, with reference to phosphoric acid, I

was induced to consider that the stannates would be found to differ from the metastannates only in the proportion of base. This analysis has proved to be the case, for representing in a general manner, the neutral stannates by the formula $Sn_3 O_6 M O$, the metastannates would have for their composition $Sn_3 O_6 3 M O$. Thus, according to this hypothesis, which I discuss at some length in my memoir, the stannic acid should be considered as a monobasic acid, and the metastannic acid as a tribasic acid. The relation which exists between the composition of the stannates and the metastannes, explains a curious fact, which I have observed, namely, that the stannates, when heated with an excess of alkali, are immediately transformed into metastannates. The stannates may be obtained by dissolving the alkalies in the cold, in stannic acid prepared by reddening nitric acid over tin. The metastannates may be produced by two different processes: first, by dissolving in the alkalies the metastannic acid eliminated from chloride of tin by an insoluble carbonate; secondly, by calcining stannic acid in a silver crucible with an excess of base. The metastannates of potash and of soda crystallize easily. These combinations are surpassed in no respect by the best defined salts, and represent, perhaps, the best crystalline combinations of tin.

In studying stannic acid I have discovered a combination of tin and oxygen intermediate between the protoxide and stannic acid, which must not be confounded with the sesquioxide of tin which M. Fuchs has recently discovered. This combination is obtained by treating stannic acid in the cold with protochloride of tin. The acid immediately takes a fine orange-yellow tint; pure hydrochloric acid remains in solution. This body, the properties of which I give in my memoir, should be considered as a stannate of protoxide of tin, corresponding to the molybdate of oxide of molybdenum (the blue oxide of molybdenum) to the tungstate of oxide of tungsten, the chromate of oxide of chrome, &c. The facility with which stannic acid is coloured yellow by the influence of chloride of tin, may serve, in many cases, to characterise this acid.

Finally, In examining into the decomposition of the stannates by the influence of heat, and extending the experiments to other metallic salts, I have arrived at this general conclusion, that certain combinations of metals with oxygen are not acid, excepting when hydrated; but in this case, the water is not displaced by bases, as with other acids, but enters as a constituent principle of the salt. If the water be driven off by heat from the metallic acid when in combination, it loses the power of uniting with bases, and is precipitated in the anhydrous state.—*Comptes Rendus.*

FORMATION OF FERRIC ACID BY GALVANISM.

BY J. C. POGGENDORFF.

The investigation of the primitive chemical action of the galvanic pile, has afforded me the occasion to observe a fact of equal interest both in a physical and chemical point of view.

The iron employed in these experiments was wrought iron of the best quality. Iron of this nature, placed in a solution of potassa, and united to platinum placed in nitric acid, gives out oxygen gas without being oxidized.

It is the same when graphite, platinum, palladium, gold, nickel, cobalt, or tin, is substituted for iron.

Silver, copper, antimony, bismuth, lead, cadmium, and, what is remarkable, zinc itself, also furnish oxygen, but whilst this gas is disengaged, there is at the same time a sensible oxidation—an alteration of the metals.

This phenomenon is particularly evident with silver and lead: these two metals are soon covered with a black coating (formed probably of the peroxide in the case of the silver); and it is not until after the formation of this coating, that the disengagement of oxygen takes place.

But the case is quite different with *cast iron*, which, by accident, I was led to use in my experiments. It is immediately enveloped in an atmosphere of a fine wine red colour, which spreads in a thin cloud through the whole of the liquor. This assumes, in a short time, so deep a colour, that it appears almost black, and the fine "*medoc*" colour can no longer be perceived, except by looking at the light through the edges of the liquid. The concentration of the solution of potash is of little consequence in this case. I have obtained the phenomenon in its full beauty with one part of hydrate of potash in four parts of distilled water.

If the solution of potash be examined with care, it will be remarked that a slight crackling takes place in the small air bubbles, and at the same time the liquor changes colour. It becomes reddish brown, turns opaque, and, after some time, generally in about half-an-hour, becomes quite colourless, having at the bottom of the vessel a brown precipitate.

The electric current does not retard this change, for it commences while the iron still forms the pile with the platinum; but it is produced very quickly, and even instantaneously, if the solution of potash be heated to ebullition. The red liquor is also rendered colourless, in a very short time, by placing a plate of zinc in it.

I was at first inclined to attribute the foregoing phenomenon

to the presence of manganese in the iron; but a more careful examination of the circumstances, and especially a chemical analysis of the brown precipitate, which is deposited after a time, and in which nothing but oxide of iron could be detected, convinced me that the colour of the liquid was due to ferric acid, or rather to ferrate of potash.

The formation of ferric acid under these circumstances is easily explained; it may be attributed to the predisposing affinity by which, under the influence of the electric current, the oxygen combines, either immediately with the iron in consequence of the presence of the potash thus offered to the acid at the moment of its formation, or previously with the potash, forming in the first instance *peroxide of potassium*, and afterwards ferrate of potash.*

This phenomenon is equally interesting under a twofold point of view: first, because we are thus enabled to form, with great facility, by the aid of galvanism, an acid, which the author of its discovery, M. Fremy, and other Chemists, have hitherto been only able to obtain, with great difficulty, by purely chemical means; and, secondly, because it is only produced with cast iron and not with wrought iron.

This latter circumstance is certainly very enigmatical. I have made numerous investigations with the view of determining the reason of this phenomenon, but have been hitherto unsuccessful: I have never been able to prepare the ferric acid either with wrought iron or with steel. All the different kinds of cast iron too do not afford this acid—of four kinds which I used, two only afforded it.

I at first attributed the difference in these results to the force of the electric current, and, therefore, made a comparison of a pile formed with wrought iron with one formed with cast iron. But the comparison gave indication of only a very slight superiority in the force of the current, and electro-motive power, in the pile formed with cast iron—that which gave rise to the production of ferric acid.

I was enabled, by lengthening the terminal wire, to make the current of the cast iron pile much weaker than that of the wrought iron pile, when the ferric acid was no less produced in the former, although not in the latter.

The great similarity in the force of the current in the two iron piles, of equal dimensions, appears to me interesting, in a theoretical point of view; for it seems not to affect the force of the current, or the electro-motive power, whether the substance

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* A fact that seems to confirm this latter opinion is, that if ammonia be used, ferric acid is not obtained.

isolated (in this case oxygen) be disengaged in a free state or combined with the metals. This is opposed to the opinion of Mr. Grove and of others, that water is more easily decomposed by the electric current if oxygen combine with the positive metal of the pile. At least, it proves no more than the general admission, that in the chemical combination of two bodies, there is a great quantity of electricity developed or absorbed.

In other respects, the current should have a certain degree of intensity for the production of ferric acid. I plunged two plates of cast iron into the solution of potash, and afterwards united them to the metals of one of Grove's simple piles; but, in consequence of the dimensions of the pile, the current was too feeble: there was only formed, in this case, a small quantity of ferric acid. On the positive plate, however, there was a portion of oxide, a fact which I have never observed with wrought iron, and which proves that, under these circumstances, cast iron has a greater tendency to oxidize than wrought iron.

In general, cast iron, especially that which affords ferric acid, is more soluble in acids than wrought iron, probably in consequence of the molicules of carbon which are intermixed with it, exercising a galvanic action upon those of the iron, and also augmenting their solubility, in the same manner as the impurities in commercial zinc render it more soluble than distilled zinc. It is possible this is the reason that cast iron in particular gives rise to the formation of ferric acid.

On the other hand, the augmentation of the intensity of the current, at least up to a certain degree, does not interfere with the formation of ferric acid. If two of Grove's batteries be united, and the current conducted into the solution of potash, ferric acid is easily and abundantly obtained by means of the plates of cast iron.*

I consider, even, that this mode of preparation is preferable to that which I first adopted, for it is not necessary to put the solution of potash in contact with the argillaceous vessel, so that the solution may be kept more pure, and the vessel preserved from destruction, which always ensues in the other way.

This mode of preparation offers one slight inconvenience, which is, that a part of the ferric acid formed, is lost, by its reduction at the negative plate. But this slight loss is amply compensated for by the much greater quantity of acid which is formed at the positive plate. I have said, slight loss: this as-

* A curious modification of this process consists in taking, instead of two plates of cast iron, one plate of cast and one of wrought iron. If these be united to the battery in such a manner that the oxygen shall be conducted to the latter, it will be disengaged in the form of gas; if the plates be now reversed, ferric acid will be formed.

sertion may appear surprising, for it may be thought that, as much ferric acid would be decomposed at the negative plate as was formed at the positive plate; but this is not the case, probably from ferric acid not being decidedly electrolitic. There is always more hydrogen disengaged from the negative plate than there is of iron separated, consequently there is more water decomposed than ferric acid.

On the other hand, in addition to the formation of ferric acid, there is also developed at the positive plate, *under all circumstances*, with a simple pile as well as with a battery, oxygen in the form of gas; but more, certainly, with the battery than with the pile. It is very possible, therefore, that, by a sufficient augmentation of the intensity of the current, oxygen gas only, and no ferric acid, may be obtained, even from cast iron.

This accessory disengagement of oxygen is unfortunate, as it prevents the determination of the composition of ferric acid by galvanism.

It is certain, in fact, that the quantity of oxygen conveyed to the positive pole, is the equivalent of that of the hydrogen developed at the negative pole. But, if the first were completely combined with the iron (whether transiently or permanently, would signify but little) the quantity of hydrogen developed would serve to estimate the oxygen in the ferric acid; the oxide of iron separated giving the proportion of iron.

But the disengagement of oxygen gas, and the uncertainty as to whether this was concerned in the formation of the ferric acid, precludes the possibility of employing this method of determination.

The extreme facility with which this acid is decomposed, prevented my attempting its isolation, or that of its salt. If this isolation be possible, it can certainly only be effected at a very low temperature.

In conclusion, I would suggest the probability, that ferric acid, which is formed, as is known, but only in small quantity, at a high temperature, may be found, ready formed, in nature; for instance, forming the colouring matter of the amethyst, in which recent analyses have, in addition to silica, discovered iron with a trace of manganese.—*Annalen der Physik und Chemie.*

PREPARATIONS OF IRON.

BY M. BERAL.

Experiments undertaken for the purpose of rendering more perfect the preparations of iron used in medicine, have led me to the discovery of several ferruginous products not yet studied,

or but little known. I shall make known the more prominent properties of these products, so as to complete what I have already published on ferruginous compounds in general, and on the citrates of iron in particular.

SESQUICITRATE OF IRON.

The citrate of the sesquioxide of iron is obtained in transparent laminæ, of a beautiful garnet hue*.

PROTOCITRATE OF IRON.

The citrate of the protoxide of iron is prepared by treating iron filings with citric acid previously dissolved in distilled water. This salt is white and pulverulent, and but slightly soluble. It is rapidly coloured by light, and by the action of moist air its composition is modified, the iron passing to a higher degree of oxidation. This citrate, like the other protosalts of iron, has a strongly marked chalybeate taste.

CITRATE OF THE MAGNETIC OXIDE OF IRON.

Combined with the magnetic oxide of iron, citric acid furnishes an uncrystallizable salt, of a green colour, and susceptible of being formed into transparent laminæ. This salt is soluble and very active, but as its taste is decidedly chalybeate, it is on this account objectionable for internal use. It is remarkable, that its solution does not alter, but preserves its green colour, although exposed to the prolonged action of the atmospheric air.

CITRATE OF IRON AND QUINA.

The citrate of iron and quina is a new salt, which was required as a therapeutic agent. This medicine is formed by the combination of four parts of citrate of iron, with one part of citrate of quina. It is obtained in the form of transparent laminæ, soluble, very bitter, and of a garnet hue. This salt is best adapted for administration in the form of pills, on account of its great bitterness.

SYRUP OF TANNATE OF IRON.

Take of

Simple Syrup	375 Parts
Syrup of Vinegar . . .	125 "
Citrate of magnetic oxide of Iron	10 "
Extract of Galls . . .	4 "

Mix and form into a syrup.

The iron in this preparation is in the state of the magnetic oxide united with an acid. It is soluble, tasteless, and susceptible of useful applications.—*Journal de Chimie Medicale*, 1840

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* The formula for its preparation has already been given.

PROCESS FOR PREPARING, BY DIRECT MEANS, THE ETHERS OF THE ORGANIC ACIDS.

BY M. GAULTIER DE CLAUBRY.

UNTIL the present time, it has been only in some of the inorganic acids and the acetic acid, that the property has been recognised of transforming alcohol into ether; the inorganic acids producing hydrated ether, and the acetic acid giving rise to acetic ether; besides this latter can only be formed by a succession of actions, the number of which depends upon the rapidity with which the operation is conducted.

With regard to the latter acid, there is some difference between the action of the crystallizable acid and that which contains a larger proportion of water.

In considering the nature of the action upon which etherification depends, I thought that if instead of distilling a mixture of alcohol with those organic acids which have hitherto been considered as insusceptible of *directly* forming ethers (that is, without having recourse to the intervention of sulphuric or hydrochloric acids, by which means compound ethers are obtained) that the acids be heated just to the point at which they begin to be decomposed, and the alcohol made to fall upon them in drops, the acid having lost its water, and being greatly in excess in proportion to the alcohol, would, in this case, determine the formation of ether. This, in fact, has been found to be the case with several acids.

The first on which I operated was the oxalic acid.

If oxalic acid be heated in a tubulated retort just to the point at which it begins to give out white vapours of the acid with only one atom of water, the alcohol, on being dropped in, is for the most part converted into ether, which distils over with a portion of unaltered alcohol. A large quantity of oxalic ether may be easily obtained in this manner.

The benzoic, succinic, and citric acids, also afford, under similar circumstances, a large proportion of ether. I have not yet determined whether that which is obtained from citric acid be the citric, itaconic, or aconitic ether. I am now engaged in investigating its real nature.

With the mucic, tartaric, gallic, and tannic acids, I have hitherto been unable to obtain conclusive results. The three last named ethers, however, have never yet been formed.

With regard to the oily acids, I have not yet succeeded in regulating the operation so as to obtain a definite result.

Spirit of wood, placed in the same conditions as alcohol, has not afforded me conclusive results. Is this in consequence of its greater volatility, or of its being more difficultly etherified? This I am unable at present to say, but I think it will be found easy to overcome the difficulties I have hitherto met with in regard to this body.—*Comptes Rendus.*

TABLE OF THE DENSITIES OF ALCOHOLIC LIQUIDS.

TO THE EDITOR OF THE PHARMACEUTICAL JOURNAL.

Sir,—The annexed table, drawn up for my own use from the best sources within my reach, may, perhaps, be acceptable to some of your readers. I trust it will be found sufficiently correct for all practical purposes; but should any material error have been overlooked, I shall be obliged to any correspondent who will point it out. I am, Sir, your obedient Servant, H. Beasley.

Table of the Densities of Alcoholic Liquids employed in Pharmacy, shewing the corresponding degrees of the principal Areometrical Scales,

	Specific Gravity, at 60° Fahr.	Gay Lussac's Alcohometer, at 59° Fahr.	Sykes's Hydrometer, at 60° Fahr.	Baumé's Areometer, at 59° Fahr.	Cartier's Areometer, at 59° Fahr.
Alcohol Absolutum			Over proof.		
Gay Lussac's	794.1	100		47.2	44.19
Ed. Ph.	796	99.6		47	44
Paris Codex	796.4	99.5		46.7	43.7
	799	99		46.2	43.2
	800	98.8		46	43
	808	97	70.7?	44	41.3
Dub. Ph. / Alcool a 40-42° P. C.	810	96.6	69.7	43.7	41
L. Ph. and Ed. 1817 ..	815	95.3	67.2	42.7	40
Amst. Ph.	820	94	65	41.6	39
Spiritus Rectificatissimus					
Hann. Ph.	822	93.4	64	41	38.5
	824	93	63	40.7	38¼
Austr. and Swed. Ph...	830	91.2	60	39.5	37
Spiritus Rectificatus					
	834	90	57.8	38.6	36.2
L. 1824, Ed. 1817, / Amer. Ph.	835	89.7	57.3	38.5	36.1
New L. and Ed. Ph. / Alcool repurgatus, / Paris C.	838	88.8	55.8	37.7	35.6
Dub. Ph.....	840	88.2	54.8	37.4	35.1
Alcool a 86 cent. P.C...	847	86	50.8	36	33.8
Austr. Ph.	850	85	49	35.4	33.3
Spiritus Communis					
Alcool duCommerce,P.	863	80.5	41	33	31
	867	79	38	32	30.3
	900	66	15.6	26	24.6
Spiritus Tenuior					
L. and Ed. Ph.	920	57	0	22.5	21.4
Dub. Ph.	919.4				
			Under proof.		
Alcool faible, P.C.....	923	55.7	2.5	22	21.2
	927	53.8	6	21.3	20.4
L. 1824, and Dub.1807	930	52.3	8.3	21	20
Ed. 1817	935	50	13	20	19.2
	940	47	18	19	18
	952	40	30	17.2	16.6
	1000	0	100	10	10

The numbers on Gay Lussac's scale denote the per centage, by measure, of absolute alcohol; those of Sykes's hydrometer the excess or deficiency, per cent., of *proof spirit* in the sample. The Batavian scale is 10 less than Baumé's throughout, water being 0 instead of 10.

THE STATE IN WHICH BUTTER EXISTS IN MILK.

BY M. ROMANET.

The author endeavours to establish the following propositions, in reference to the phenomena attending the formation of butter:

1st. At the moment of the emission of the milk, the globules, of various dimensions, which are clearly discerned by means of a microscope, and which tend, by reason of their specific gravity, to rise to the surface, contain the butter in a perfect state.

2d. These globules contain the whole of the butter, and nothing but butter.

3d. This substance is found in the form of a pulp, enveloped in a pellicle, which is white, translucent, thin, elastic, and resistant.

4th. The action of churning produces no other effect than by constant rubbing, to attenuate the pellicles which envelope the pulp, and ultimately to cause their mechanical rupture, thus setting at liberty the butter.

5th. If the butter is all formed almost at the same instant, after the churning has been continued for a certain period, it is because this mechanical action is exercised pretty equally upon all the globules within the same space of time, so that the rupture of the pellicles takes place nearly simultaneously.

6th. It is the empty coats of the globules which render the butter-milk and the water employed to wash the butter, white and opaque.

7th. The acidity which is always manifested in butter-milk, at the instant of the formation of the butter, however fresh and alkaline the cream might have been when put into the churn, is due to the immediate contact of the butter, and the acid principles which M. Chevreul has shown to be contained in this substance; a contact from which the liquid was preserved while the particles of butter were retained in their envelopes."—*Comptes Rendus de l'Académie des Sciences.*

PURE BORACIC ACID.

The usual method of preparing boracic acid consists in decomposing borax by means of sulphuric acid; but the boracic acid thus obtained is always contaminated with a certain quantity of the sulphuric acid used in its preparation. M. Wackenroder has pointed out a better method, as follows: dissolve forty parts of borax in one hundred parts of boiling water, and add twenty-five parts of hydrochloric acid to the solution while hot. Collect, on a filter, the boracic acid, which will crystallize on the cooling of the liquor, wash it a few times with cold water, allow it to drain, redissolve it in a little hot water, and crystallize it a second time. Wash the crystals with a little cold water and press them between folds of filtering paper. The mother-water and the washings of the crystals may be evaporated so as to afford a further quantity of the acid. This boracic acid, when dry, will still retain a trace of free hydrochloric acid which may be driven off with a part of the water of crystallization by drying the acid at a temperature of about 234° Fah. After this operation the acid is pure.—*Berzelius's Report on the Progress of Science.*

MEDICINAL PHOSPHORIC ACID.

M. Vakenroder finds that medicinal phosphoric acid is best prepared by a process already known, but which he has modified in the proportions of the ingredients, and also in the manipulation. The following is his process: mix 200 parts of calcined bones, reduced to fine powder, with 1300 parts of water; add to them 150 parts of sulphuric acid diluted with 200 parts of water; after allowing them to remain in contact, in the cold, for twelve

hours, expose the mixture to the action of a gentle heat for half an hour, replacing the water which is lost by evaporation. The liquor is now to be strained off with expression, and the marc washed with 200 parts of water. Filter the solution, and pass a stream of sulphuretted hydrogen through it; filter it again, and then evaporate it down to 160 parts; add to it 320 parts of alcohol; after twenty-four hours filter the solution, and wash the filter with thirty parts more of alcohol. Recover the alcohol by distillation, and evaporate the residue until reduced to 36 parts; add distilled water to make it up to 120 parts; digest it with charcoal, filter, and concentrate the acid.

Phosphoric acid thus prepared, still contains a little superphosphate of lime, but it is sufficiently pure for medicinal use.—*Soubeiran's Pharmaceutical Notes.*

PROCESS FOR OBTAINING BENZOIC ACID

VERY PURE, AND FREE FROM EMPYREUMATIC SMELL.

BY M. JAUSSENS.

Mix one part of benzoic acid of commerce with eight parts of distilled water, add an excess of solution of ammonia, and afterwards treat the solution of benzoate of ammonia formed, with purified animal charcoal.

Filter the solution, and decompose it with hydrochloric acid; the benzoic acid will be separated in the form of beautifully white flakes. These flakes, thrown on to a filter and washed several times with distilled water, are afterwards to be drained, and then dissolved in a sufficient quantity of alcohol. The alcoholic solution is to be filtered, and then diluted with distilled water, so as to precipitate the benzoic acid, which is but sparingly soluble in this liquid. By this means, the essential oil, to the presence of which in the ordinary flowers of benzoin their peculiar smell is due, is retained in solution in the alcoholic liquor. It only remains to crystallize or sublime the precipitated acid to obtain it in a state of great purity and beauty.—*Archives de la Médicine Belge.*

PROPERTY POSSESSED BY CERTAIN SPECIES OF SUGAR

AND OTHER NEUTRAL VEGETABLE PRINCIPLES,

TO DISSOLVE SOME OF THE METALLIC OXIDES IN COMBINATION WITH THE ALKALIES.

BY M. LASSAIGNE.

The author at the conclusion of a memoir presented to the Academy of Sciences at Paris, gives the following as deductions from the facts adduced:

1st. A certain number of immediate neutral principles obtained from vegetables, such as the different kinds of sugar, possess the property of rendering soluble in water, by the aid of the alkalies, several hydrated metallic oxides.

2d. Many of the resulting compounds are similar in colour to the solutions of the salts of these oxides.

3d. These soluble compounds may be compared to double salts, in which the organic matter plays the part of an acid.

4th. Among these compounds, those which have for their base the deutoxide of copper, are either spontaneously, or by the direct application of heat, destroyed. In this reaction, the deutoxide of copper is reduced to the state of protoxide, which separates either combined with water, or in the anhydrous state, according to the concentration of the liquid.—*Comptes Rendus.*

PROCESS FOR THE PREPARATION OF ULTRAMARINE.

BY M. J. DE TIREMON.

TAKE OF

Fine clay, powdered and sifted	100 parts.
Gelatinous alumina, representing of the anhydrous	7 "
Carbonate of soda, dried, 400 parts, or crystallized	1075 "
Flowers of sulphur	221 "
Sulphuret of arsenic	5 "

The mixture of these substances must be made with great care.

Into the carbonate of soda, liquified with its water of crystallization, throw the sulphuret of arsenic in powder, and when this latter substance is partly decomposed, add the gelatinized alumina (this alumina is obtained from the alum of commerce, precipitated by carbonate of soda—the precipitate collected on a filter, and washed once with river water). Afterwards add the clay and the flowers of sulphur previously mixed. This mixture, reduced by the heat, is put into a covered crucible, carefully heated, to drive off the remaining water, then raised to a red heat. The fire should be so managed as to agglutinate, but not to melt the mass. After allowing it to cool, it must be again heated to drive off any remaining sulphur; it must then be broken and rubbed down with river-water. The powder held in suspension in the water is collected on a filter. When the mixture has been well made, the whole of the product may be used; but in case the combination has been imperfect, there will be found a number of colourless particles, or when the heat has been carried to complete fusion, there will be some fragments of a brown colour, especially when the crucible is of a bad quality, and has been much acted upon. These results never occur when the operation is conducted with care. The filter should be allowed to drop without further washing the powder, and the latter is then to be dried. The product will be of a beautiful soft green colour, which afterwards becomes blue.—*Comptes Rendus.*

BOOKS RECEIVED.

The Cyclopædia of Popular Medicine, intended for Domestic Use, with numerous Illustrations. By KEITH IMRAY, M.D. *Simpkin, Marshall, & Co.*

THE object of this work is, as the author states, "to describe in plain and simple terms the causes, symptoms, and treatment of disease—the whole science of medicine rests on these three points: we ascertain causes for the purpose of avoiding, symptoms for the purpose of distinguishing, and treatment for the purpose of curing, disease."

It is not the design of the author "to supersede the practice of medicine, by making every man his own doctor; but to afford simple rules for the alleviation of disease and the preservation of health, which may be had recourse to whenever circumstances render it expedient or necessary."

Some difference of opinion prevails as to the amount of medical

knowledge, which the public ought to possess. Danger sometimes arises from an undue confidence in a superficial acquaintance with this subject; and, on the other hand, fatal errors are not unfrequently the result of ignorance. In the present age, when education in all its branches is extending itself in every grade of society, the science of medicine is unquestionably entitled to a share of popular favour. There are certain facts relating to physiology and the functions of life, the effects of remedies in daily use, and the amount of importance to be attributed to ordinary symptoms, with which all persons should be more or less conversant.

The especial purpose for which this knowledge is essential, is in enabling patients to judge when it is necessary to send for a medical man. The want of it is a great source of perplexity from which much mischief arises. A person who is unacquainted with the liabilities indicated by certain symptoms, often loses the opportunity of obtaining timely advice, until a disorder has assumed a formidable aspect.

The work before us affords that kind of information which is likely to be useful. The early symptoms and usual course of various disorders are concisely described, and such remedies are enumerated as are likely in ordinary cases to afford relief. General rules respecting diet and regimen are introduced, and many of the evils to be apprehended in each particular case are pointed out. A variety of well selected formulæ are interspersed in the work, and it also contains plates illustrating the best modes of applying bandages to fractured limbs. This latter subject goes rather beyond what appears necessary for popular use, and is, as well as some other portions, more adapted to students in medicine or surgery than to the public in general.

Some precautions are always necessary in the application of a work of this description. Much injury may sometimes be done by scrupulously following instructions of a general nature, which may happen to be inapplicable to the particular case. It too often occurs that persons whose knowledge is superficial, are struck with some isolated fact or observation, and act upon it without considering other particulars, or understanding the principle on which the course is recommended.

In treating of asthma Dr. Imray observes, "some individuals are much relieved by drinking brandy and water." We have no reason to doubt the fact, but would not recommend *all* asthmatic patients to adopt the beverage.

Again, the following injection is recommended as a remedy for Gonorrhœa:

> "Nitrate of silver five grains.
> Water one ounce. To be injected two or three times a day."

"Under urgent circumstances, it may sometimes be cut short by injecting the nitrate of silver (*ten grains to the ounce*) as soon as the pain and scalding are discovered."

This may be very good practice in the hands of the surgeon, but if adopted by patients who are unacquainted with the *modus operandi* of nitrate of silver, the remedy *might* prove worse than the disease.

Similar observations might be made with reference to the administration of elaterium, digitalis, strychnia, and many other drugs of a powerful nature, which ought rarely, if ever, to be ventured upon by patients, in the absence of medical advice.

The remedies with which the public are entrusted, should be such as may be used without any particular risk, and which do not require a very minute observance of their effects from time to time, in order to regulate their continuance or the dose. But it is impossible to limit popular materia medica by any general rule, or to point out the boundary line of safety in this respect. There is indeed a limit, beyond which even the experience of the most skilful physician is unavailing, but this also is involved in mystery.

The great object in a popular work on medicine should be to describe, as explicitly as possible, not only the liabilities which accompany various forms of disease, but also those which belong to the treatment, and rather to instruct the patient *when to apply for medical advice*, than to induce him to undertake the treatment of himself, by giving directions which, however elaborate, can never supply the place of practical knowledge.

These precautionary remarks, with reference to patients, are equally applicable to Pharmaceutical Chemists, whose duty it is to use every possible precaution in the sale of powerful medicines, and to refuse to supply them when they have reason to apprehend that injury might result.

Manual of British Botany. By D. C. Macreight, M.D. *John Churchill, Princes Street, Soho.*

In this work, the plants indigenous to, and commonly cultivated in Great Britain, are arranged and described according to the natural system of De Candolle, and a series of analytical tables is given for the assistance of the student in the examination of British plants. It is principally intended as a book of reference, and has evidently been compiled with considerable care and labour.

TO CORRESPONDENTS.

We have received an official communication from Mr. Durand, Corresponding Secretary of the Philadelphia College of Pharmacy, acknowledging the receipt of the PHARMACEUTICAL JOURNAL, proposing a regular exchange of Journals and Correspondence, and expressing a desire to promote the objects of the PHARMACEUTICAL SOCIETY.

MR. BARTLETT has pointed out an error in the directions for preparing Pulvis extracti colocynth compositi, by Mr. Haselden (page 602, Vol. 1). The error consists in directing the spirit to be drawn off *before* the pulp is pressed, by which means that portion of colocynth which had been dissolved by the spirit would be left in the dregs. It is evident that the pulp should be first pressed, and the spirit drawn off from the liquor.

L. P. B. thinks Mr. Fison (page 662) is mistaken in supposing that the Prepared Sevum consists merely of old mould candles, and believes it to be tallow impregnated with oxygen gas.

MR. BLACK recommends the addition of a few drops of diluted acetic acid to the lard as a means of facilitating the reduction of the mercury (about 20 drops to the pound). Although the quantity is small, we doubt the propriety of adding *any acid* which could enter into combination with the metal.—ED.

MR. WICKHAM proposes in making the compound decoction of aloes, to macerate the solid ingredients in the compound tincture of cardamoms, to strain, and afterwards to add the water. We need hardly say the product would be essentially different from that made according to the Pharmacopœia.

A MEMBER (Bolton) enquires how ink may be preserved from turning mouldy and what can be the motive for adding chalk, which he says is sometimes done? The tendency to become mouldy may be prevented by addng a few grains of bichloride of mercury. or by infusing a few cloves with the other ingredients. A few drops of kreosote will also be found to answer the purpose. We imagine the object in adding chalk is to saturate the excess of acid, and thus to prevent the corrosion of steel pens.

P. J. The sample marked J is worthless. The other is rather better, but not good.

R. I. T. M. P. S. The subject is under consideration, but we are not yet in a position to take the steps recommended.

MR. KNIGHT, of Bristol, has favoured us with a plan for establishing provincial Schools of Pharmacy, which we hope in due time to see carried into effect. We think, however, that it would be imprudent to undertake so comprehensive a scheme, until the school in London is completely established, after which others may be formed, according to the means within our reach.

MR. JAMES JOCE has sent us a letter for insertion, stating his reasons for not having joined the Society. We have not published it, because it contains nothing more than the objection to the terms of admission, which has been so often answered, that we only need refer to our former remarks on the subject in Number III, and the Report of the Council in No. XII. In order to support any argument, it is necessary to be acquainted with the facts of the case.

"*One of the four*" states, that out of a considerable number of Druggists in a certain district, only four have joined the Society, and observes that those who evince indifference, "are not nice to a shade how they adulterate their drugs." The latter assertion is a sweeping one; if correct, it is sufficient to account for the former.

"C. H. AN ASSOCIATE," is informed that the diploma is only intended for Members. *See* No. VI., page 265.

Advertisements to be addressed to Mr. CHURCHILL, Princes Street, Soho.

Other Communications to THE EDITOR, 338, Oxford Street.

PHARMACEUTICAL JOURNAL.

VOL. II.—No. II.—AUGUST 1st, 1842.

PHARMACY IN GREAT BRITAIN.

EDUCATION AND EXAMINATION.

In order to explain as clearly as we are enabled to do, the nature of the several examinations which are to be instituted, and the progressive steps by which the student will be expected to rise from the commencement of his career until he becomes a Member of the Pharmaceutical Society, we shall commence with an allusion to the initiation of the Apprentice, into the art and mystery of the business.

Having lived for a month or more on trial with a Pharmaceutical Chemist, and decided in favour of embarking in the business, the student must be examined in his classical attainments. If in London or within ten miles, this will take place at the house of the Society, but those who reside at a distance, and cannot make it convenient to come to London for the purpose, may be examined by a classical tutor or such qualified person as may be satisfactory to the Board of Examiners. The object of this examination is to prevent uneducated young men entering the business. The Latin language, being an acquirement indispensable to the Chemist, will form the ground-work of the present examination; but French, Arithmetic, and other branches of knowledge are also important, and it has been suggested by some persons, that Greek and Algebra ought to be included. This however is more than we can expect at present, and whatever may be the future decision of the Council as to the extent of acquirements required in an Apprentice, we are justified in stating that the early examinations will not be unreasonably strict.

The Secretary having received the certificate of qualification given by the examiner or examiners, the indentures are to be executed and registered in due course, and the apprentice commences his labours. On payment of the subscription of one guinea annually, he is entitled to enjoy whatever educational advantages a connection with the Society can afford, and by paying proper attention to the practical details of his business,

and employing his leisure hours in study, he ought, in the course of four or five years, to become a qualified Assistant.

But before he can assume the grade of an Associate, he must pass an examination in Pharmacy, and it is desirable that this should take place immediately, or as soon as possible after the expiration of his term of apprenticeship. In order to remove any unnecessary obstacles to the early attainment of this rank, without lowering the standard of qualification for members in a manner which would affect the credit of the Society, a MINOR EXAMINATION is instituted, which is designed expressly for Associates. The subjects comprised in this examination, are the Pharmacopœia of the London College of Physicians, Prescriptions, and practical Pharmacy. An acquaintance with the substances in daily use in Pharmacy, a knowledge of the technical terms employed in designating and prescribing them, and the ordinary affinities and decompositions which are involved in the processes of the Pharmacopœia and dispensing business, with a certain amount of practical skill in manipulation, comprehend the substance of the attainments which can reasonably be expected in a student at this period. Having been found sufficiently qualified in these particulars, he receives a Certificate from the Board of Examiners, stating that he is competent to act as an Assistant to a Chemist and Druggist, and is eligible as an Associate of the PHARMACEUTICAL SOCIETY. He must now pursue his studies with increased diligence, and if in London, or any other place in which lectures are within his reach, he should avail himself of the opportunity, especially if he has not enjoyed this advantage during his apprenticeship. Those who from locality, or other circumstances, are unable to attend lectures, should endeavour to supply the deficiency by reading, collecting and studying plants, making chemical experiments on a small scale, and endeavouring to apply the knowledge obtained from books, to the practical operations of the dispensing counter or the laboratory.

Lectures are not *absolutely necessary* to the student in Pharmacy. We have occasionally met with young men who have been educated in the country, remote from any advantages of this description, who have, by their own industry, and by availing themselves of instruction and opportunities of improvement afforded by their employers, attained a sound practical knowledge of their business, and a degree of proficiency which would have enabled them to pass with ease the examination to which we have been alluding. Yet it cannot be denied, as we have already had occasion to observe, that lectures *greatly facilitate* the acquirement of information—that they lessen the labour of the student by directing his researches into the right channel

and giving him a methodical plan of study, and consequently this privilege should never be undervalued or neglected by those who have the means of enjoying it.

When the Associate has sufficiently qualified himself, and wishes to change his condition by commencing business on his own account, his next step is to obtain the diploma of the PHARMACEUTICAL SOCIETY, by passing the MAJOR EXAMINATION. This comprises the Pharmacopœia of the London College of Physicians; Chemistry, Materia Medica, Botany, and Pharmacy as embodied in the Pharmacopœia: Prescriptions, and the antidotes for common poisons. The difference between this examination and the former consists in the degree of proficiency required on all the subjects, and the addition of the science of Chemistry, Botany, and the rudiments of Toxicology, to those enumerated as applicable to Associates.

But it must be understood that the Council have determined to moderate the severity of both the minor and major examinations in the first instance, adapting them to the present condition of the candidates, and intending to increase the extent of the ordeal as the progress of education enables them to do so, without inflicting injustice on individuals, or obstructing the prosperity of the Society, by making the laws respecting admission too prohibitory.

It has frequently been urged as an objection to the constitution of the PHARMACEUTICAL SOCIETY, that membership obtained by purchase, and a diploma which does not represent an examination, can confer no credit or professional respectability on members. If all our brethren had entertained the same limited views on this subject, the nucleus of the Society, if formed at all, would have been extremely small, and it would have been impossible to erect upon such a basis the superstructure of an institution which would come into general operation within a reasonable time.

Experience has demonstrated the policy of the course which was adopted. We have now united into one body a large number of Members and Associates—we have obtained an amount of support which will enable us to carry out the objects we have in view, and we have extended the interest in the Society to all parts of the kingdom.

Those who objected to join us as original Members or Associates, for the reason above alluded to, have now the opportunity of gaining that distinction which they desire, by passing an examination; and we hope that the same kind of emulation will prevail even in cases in which an examination is not compulsory.

It cannot be expected that a man who has been *many years*

in business would willingly submit to an ordeal which might place his professional reputation in jeopardy, and which he would have passed with comparative ease at an earlier period.

The groundwork of an education in Pharmacy, as in other avocations, may have become involved by time in some degree of oblivion, although the superstructure is not defective; and a man may be perfectly qualified to superintend a business which he has established, and for many years carried on, although the rudiments of his early studies, which would naturally occupy a place in an examination, are partially obliterated from his memory.

For this reason, the Council have thought it right to take into consideration the circumstances of those Chemists, who have not had the opportunity of obtaining much information as to the nature and objects of the Society, and who may have withheld their support on this account. Accordingly, in the law respecting examination, an exception was introduced, empowering the Council to admit without examination, on payment of an entrance fee, such persons as had been actually in business on their own account prior to July the 1st, and who might fairly claim this indulgence.

But it must be understood that this exception will be acted upon with a due consideration of the circumstances of each particular case, and subject to a ballot; that it is not intended for young men who have recently commenced business, and is not applicable in any instance to Associates. The great object which we have in view is improvement: the enjoyment of privileges and prosperity should be looked forward to, as the reward of merit, and not as merely the result of a defensive struggle; and in the attainment of that position which we hope to enjoy, the education of our members, and the examination by which their qualifications will be tested, will form the basis of our claim to the superintendence and controul of our own body.

It is therefore of the highest importance, that the improved education which we have undertaken to provide, and the examinations which are the natural sequel, should come into general operation without delay.

Those young men who feel an interest in their profession, and are ambitious of gaining a creditable position in it, should consider the advantage they will enjoy in the possession of a certificate of qualification, and instead of shrinking from a trial in which they ought to feel some confidence of success, their whole energies should be devoted to those preparatory studies which are likely to secure them against a failure.

Many who have come to London to obtain situations, and whose time is therefore unoccupied, would find it answer their

purpose to read for an examination. The library of the Society is open during the day, and it contains an ample collection of books on every subject which relates to our business. It is obvious that a young man would be likely to obtain a situation with much greater ease after his qualifications had been tested, and found satisfactory by the Board of Examiners. Others who are about to try their fortunes as Chemists on their own account, will find the distinction which they would gain by passing an examination a great advantage.

We have heard several Associates express a determination to come early into the field and speculate on the probability of passing an examination on the occasion of the first meeting of the Board; and we hope that when the day arrives, the number of candidates will not be found deficient. We have hitherto endeavoured to prevail upon our brethren to join the Society without delay, urging as an inducement the facility of admission; and the object with which this course was taken has been fully attained. We shall henceforth dwell upon the advantage of honorary distinction and the importance of carrying out to the fullest extent the plans which we have adopted in reference to education and examination; we would, therefore, impress upon the minds of our Associates, as well as on those who have not yet joined us, that by presenting themselves at the Board and passing an examination they will not only raise their own character, but materially advance the prosperity of the institution.

The advantages of an examination are two-fold; in the first place, it is intended to serve as a stimulus to preparatory studies; and, secondly, to demonstrate the amount of proficiency thus attained. It should be followed up by assiduous attention to all the practical details of Pharmacy, in order that the public as well as the candidate himself may derive the full benefit from the result. A superficial acquaintance with the general principles of the science, may, in some cases, enable a student to pass an examination, and the practice of "grinding young men for the Hall" is not uncommon; but dependence should not be placed on temporary aptitude obtained in this manner. The successful candidate must not be satisfied with the possession of a certificate or a diploma: he will be obliged to pass a series of other examinations, before the most severe of all Boards of Examiners—namely, the public; and unless he can maintain, in the daily performance of his duties, that character which his certificate implies, he cannot reasonably expect to enjoy the reward. The Pharmaceutical Chemist, as well as every other member of the community, should recollect that his own prosperity will be in proportion to the benefit which he confers upon

the public, and that eminence in any profession must be the result of continued industry and methodical application.

There are some persons who appear to be gifted with a peculiar genius, and who are enabled to strike out a path for themselves in whatever pursuit they embark, which leads them to distinction; but cases of this kind being rare, it is necessary for the general welfare and improvement of each particular class, that some regular system should be adopted, the principles of which may be more or less applicable to all the individuals which it comprises.

With this view, the education and examination of which we have given a very brief outline, have been instituted, the details are regulated and will be modified according to circumstances, and a course of proceeding is prescribed and published for the guidance of those for whose benefit and improvement the Society was established. The Council having used their utmost endeavours to promote the welfare of their brethren by framing such regulations as they conceive likely to effect this object, it becomes the duty of the members to assist in carrying out the measures which have been adopted. In the first place, therefore, we hope that all our members will support the principles of the Society in reference to Apprentices, by satisfying themselves that those whom they receive as pupils have had a liberal education; and for this purpose complying invariably with the requisitions respecting preliminary examination. The progress of the pupil may be greatly promoted by the judicious superintendence and occasional indulgence of his employer, and any encouragement which can be given to scientific pursuits, without interfering with the daily routine of business, will be found materially beneficial to the interest of both parties.

The progressive steps through which the pupil must pass during the course of his education, are designed to facilitate the gradual and methodical acquisition of knowledge, the Minor Examination will serve to prepare the Associate for the more severe ordeal which is to follow; and the Class Examinations, which will be conducted by the professors at the close of their respective courses of lectures, will have the same useful tendency.

In conclusion, we may be allowed to repeat, that it is not merely the payment of an annual subscription to the Pharmaceutical Society that will confer honourable distinction on the Subscriber or ensure the prosperity of the institution; but it is by the individual efforts of all our Members and Associates in carrying out judicious arrangements and promoting an efficient system of education and examination, that we can hope to enjoy the increased confidence and support of the public.

TRANSACTIONS
OF
THE PHARMACEUTICAL SOCIETY.

PHARMACEUTICAL MEETING,
JULY 13th,

MR. PAYNE, VICE-PRESIDENT, IN THE CHAIR.

The first paper was

ON THE ADULTERATION OF SENNA.

BY JACOB BELL.

Although it is well known that the leaves of Alexandrian senna are invariably mixed with a certain proportion of the cynanchum arguel, no decisive measures have yet been adopted to put an end to this fraud; other leaves are occasionally found in it, but the above is the adulteration which chiefly demands our attention, from the circumstance that it is systematically practised to so great an extent as to affect materially the quality of the drug. Alexandrian senna contains a mixture of two or more species of true senna. It consists principally of the cassia lanceolata, with a few leaflets of cassia obovata and cassia obtusata, and, according to some authorities, it sometimes contains cassia acutifolia. This mixture is unimportant, but the cynanchum, which generally constitutes a fifth of the weight on an average, possesses properties differing in some respects from true senna, and which render it particularly objectionable.

Dr. Christison has paid considerable attention to this subject; and in order to test the quality of the cynanchum, he administered it to several patients, prepared in the same manner as the senna which he was in the habit of prescribing. He found that it produced much griping, flatulence, and uneasiness, with a very scanty purgative effect, and he attributes the unpleasant effects and nauseous taste frequently ascribed to senna, to the leaves of cynanchum contained in it. It is chiefly on this account that the Alexandrian senna is seldom used in Edinburgh, the Tinnivelly senna having almost entirely taken its place.

Dr. Christison mentions a case in which a patient, who had been in the habit of taking a syrup of Tinnivelly senna, being supplied with the same preparation in which the Alexandrian had been substituted, was extremely annoyed at the griping and un-

satisfactory effect. On examining the leaves, they were found as usual much adulterated with the cynanchum. A syrup was prepared from the Alexandrian senna, from which the spurious leaves had been removed, and the result was as good as that obtained from the Tinnivelly; but this process being attended with too much trouble to admit of its being generally adopted, there appeared to be no advantage in using Alexandrian senna while the Tinnivelly was free from objection.

This is a question which deserves the consideration of the Pharmaceutical Society, as it ought to be decided which kind of senna is actually the best, and if we give the preference to the Alexandrian, in accordance with the usually received opinion, we ought to take steps for preventing an adulteration which is calculated to bring the article into disrepute. In cases of this kind individuals have but little opportunity of effecting a reformation; but a society, one object of which is to improve the quality of our Materia Medica, is in a position to exert a beneficial influence. The Alexandrian senna, like every other commodity, is collected and brought into the market according to the demand, and while we are willing to submit to the imposition, and offer no opposition to the circulation of a spurious article, it is not likely that the collectors will discontinue their present practice.

But it is our duty as a public body to issue proper instructions respecting the importation of drugs, and by publishing among our members an exposure of any fraud, with the means of detecting it, we shall confer on a genuine article that comparative value which will ensure a constant supply in the market. There is one objection to the general adoption of the Tinnivelly senna, which is, that the quantity imported into this country is not nearly sufficient to meet the demand. It is cultivated only on one estate at Cape Comorin, and in the event of a deficiency the other varieties of East India senna (Bombay or Madras) might be substituted. As these are inferior in quality, it is necessary to observe the distinction. The Tinnivelly senna is known by the size of the leaflets, which are much larger than those of any other variety; they are also less brittle, thinner, and larger, and are generally found in a very perfect state, while the other varieties, especially the Alexandrian, are more or less broken.

The leaves of the cynanchum are similar in form to those of the lanceolate senna, but they are thicker and stiffer, the veins are scarcely visible, they are not oblique at the base, their surface is rugose, and the colour grey or greenish drab; their taste is bitter and disagreeable, and they are often spotted with a yellow intensely bitter gummo-resinous incrustation. Being less fragile than the leaflets of true senna, they are more often found entire, and are very easily distinguished from the varieties which con-

stitute true Alexandrian senna. In their botanical characters they are essentially different, being distinct leaves, and not leaflets, which is the case with true senna. Samples of the different species of senna are on the table as well as the cynanchum. The flower and fruit were sent for exhibition by Dr. Pereira.

The Chairman observed, that the term *fraud*, as applied to the admixture noticed in the paper, was rather a strong one: he would be glad to know whether it was generally considered to be intentional or accidental.

Mr. Bell said, he believed the natives who furnished the senna were indifferent on the subject, believing it to be of little or no importance. Some importers had endeavoured to put a stop to the adulteration, but without success, as the exportation was under the controul of Mehemet Ali, by whose orders the various supplies consigned to the general depôt were systematically mixed. The senna in some places was free from the cynanchum until this operation had taken place. The object in bringing the subject forward was to induce the Members of the Society to combine in refusing to purchase Alexandrian senna when thus contaminated, and by bringing the Tinnivelly into competition, to oblige Mehemet Ali to discontinue the practice.

Mr. Pedler adverted to the fact, that the importation of Tinnivelly senna was very limited, and that during two seasons, a few years ago, none was imported, in consequence of which the price rose to six or seven shillings a pound. If a great demand should arise the supply would be quite inadequate.

Mr. Squire asked Mr. Bell, whether he had tried the comparative effect of the infusions of cynanchum and Alexandrian senna.

Mr. Bell replied that his observations on that subject were on the authority of Dr. Christison, who had tested their action in a considerable number of cases.

The Chairman remarked, that according to the general opinion of medical men, the stalks of the senna occasioned griping, but it appeared probable, from the experiments of Dr. Christison, that this was produced by the cynanchum.

Mr. Davy observed, that although the adulteration of Alexandrian senna had long been known to exist, that kind was, nevertheless, generally preferred. The Tripoli senna contained none of the cynanchum, but it was inferior in its efficacy and very little was imported. He considered that the only method of preventing the adulteration of Alexandrian senna was to refuse to purchase it as now imported, which would bring Mehemet Ali to his senses.

Mr. Redwood thought it should be understood, that although the Tinnivelly senna was recommended as being nearly as good as the Alexandrian, it would not be justifiable on any account to substitute for it the common East Indian, which, although originally the same species, was very inferior in quality — a result probably depending on the mode of cultivation.

ON AN EXPLOSIVE COMPOUND FORMED DURING THE DISTILLATION OF HYDROCYANIC ACID.

BY MR. ALSOP.

The late catastrophe at Apothecaries' Hall, on the preparation of fulminating mercury, has recalled to my recollection a circumstance which took place several years since, which may probably be interesting to the members of the Pharmaceutical Society.

At the time adverted to, I was residing at the house of John Bell and Co. and we were accustomed to prepare hydrocyanic acid, by distilling the bicyanide of mercury with hydrochloric acid; on one occasion the process was stopped before the whole of the prussic acid had been evolved from the materials in the retort, which were therefore reserved to be added to a future distillation. This liquid, retaining strongly the hydrocyanic odour, was transferred to a stoppered phial and kept in a dark closet for two or three months. It was subsequently submitted to distillation, together with fresh materials, in a retort capable of holding about four pints, and which was more than half full. The heat of a lamp had not long been applied to it, when an opalescent appearance was manifested, and a gradual formation of exceedingly minute and pearly crystals was observed to pervade the liquid. This was doubtless no other than fulminating mercury. At first it was supposed to be protochloride of mercury, arising from the decomposition of a protocyanide which appears sometimes to be formed by acting on Prussian blue, and therefore did not attract much attention, notwithstanding its suspicious appearance. This deposit continued to increase; it was left for a few minutes, and happily no one was present, when the laboratory was shaken by a most alarming explosion. The contents of the retort were discharged on the ceiling, showing that the explosion had taken place from the bottom, to which the deposit had subsided. The fragments of the retort were also entirely dispersed—tradition says, "they were no where to be found." The laboratory man in alarm rushed into the apartment, and was in great danger from the hydrocyanic vapour, when he was hastily removed.

The circumstance is curious, as presenting the formation of this dangerous substance where it was quite unlooked for; and, although the fulminic acid appears to be isomeric with the cyanic, it is rather difficult to account for the formation of an oxygen acid united with an oxide, from the elements concerned, *viz.* bichloride of mercury, bicyanide of mercury, and hydrochloric and hydrocyanic acids, unless in some way water had been decomposed, and the hydrogen liberated or disposed of. The bicyanide was prepared by boiling red precipitate with Prussian blue, whether, in this instance, well crystallized salt only was employed, I cannot now say, but, on considering the subject, I strongly incline to the opinion, that nitric acid must have been present, probably from its not having been perfectly expelled in the preparation of the red precipitate.

While on this subject, I will advert to a remark common in early chemical works, that hydrocyanic acid has the property of expanding to five times its bulk any gas with which it may be mixed, and that many dangerous explosions have arisen from this cause, on which account capacious vessels are directed to be employed in its preparation. I have never observed any such mischievous expansibility in the ordinary form in which it comes over, and should explosions have arisen from the concentrated acid, I should rather apprehend it might have arisen from its passing into the gaseous state by change of temperature, in vessels not large enough to allow of its expansion, or not strong enough to bear it, rather than from any mysterious propensity of outriding any other gas with which it may come in contact. Another conjecture arises, whether these early operators may not have encountered unawares, some of these dangerous fulminates or nitrurets.

Professor Clark thought Mr. Alsop's paper valuable in a practical point of view, as it was desirable to know under what circumstances accidents of this kind were likely to take place, even although the cause could not be satisfactorily explained. He thought in the present case the explanation given by the author might be questioned, as he could not account for the formation of fulminating mercury under the circumstances. He might observe, however, that the muriatic acid, even that which is sold as pure, frequently contained arsenic; and it was well known that some of the compounds of arsenic were explosive. This was also the case with some of the salts of tin.

The Chairman hoped the information contained in Mr. Alsop's paper would prove a warning to young men who might be engaged in experiments. It might not, perhaps, be an unsuitable

time to make a passing allusion to the late melancholy event at Apothecaries' Hall. Mr. Hennell had been a fellow-student, and was always an enthusiast in pharmaceutical and chemical pursuits. During an interview which he had with him a short time before his death, he (Mr. Hennell) expressed great interest in the success of the PHARMACEUTICAL SOCIETY, and regretted that he had not yet been able to attend any of the meetings.

ON ANNUAL AND BIENNIAL HYOSCYAMUS.

BY JOSEPH HOULTON, M.D.

I BEG leave to direct the attention of the PHARMACEUTICAL SOCIETY to the consideration of an annual cultivated hyoscyamus which is now in season, and which has so much of the appearance of the true hyoscyamus niger, that it may be easily taken for that plant; yet a practised botanical eye can readily detect the difference.

Observing in that excellent work of Dr. Pereira's on Materia Medica, that there is an annual variety cultivated at Mitcham, I wrote to Mr. Tipple, surgeon of that place, who politely furnished me with some of the seeds, which I sowed in my garden in March last, and the plants are now in flower.

The flowering period of the true indigenous hyoscyamus niger is now, I believe, past, yet I have some reason to think that we shall for some weeks to come be supplied with a fine fresh flowering hyoscyamus, that is the annual. I was yesterday in the Royal Botanical Gardens, Regent's Park, where I saw plenty of the annual but none of the biennial hyoscyamus. I am now not surprised that authors should disagree respecting the duration of this plant. Thus we see in Alston, "*the black* (*henbane*) *is always biennial;* Bergius, *biennis;* J. A. Murray, *biennis.* In Smith, Hooker, Duncan, &c., *annual.*

I am not at present able to determine the botanical relation of the annual to the true hyoscyamus niger in its degree of affinity, nor am I able to give any information respecting the difference in the medicinal properties of these two plants—these are two important points, and deserve to be carefully investigated; and I hope before next season we shall be in possession of that knowledge, by the labours of some who are competent to carry on the enquiries in a proper manner.

The Chairman enquired whether any Member present had observed a difference in the medical properties between the cultivated and the wild hyoscyamus, and observed that cultivation

might convert the biennial plant into an annual, as was known to occur in some cases. He regretted that the author of the paper was not present, having understood that it was his intention to bring specimens.

Mr. Squire said, that although he gave a preference to the wild hyoscyamus, he did not consider the difference between that and the cultivated to be very great.

Mr. Davy had not been able to discover any difference between the wild and the cultivated hyoscyamus, either in the plant or extract.

ON THE OXYGENIZEMENT OF ADEPS

FOR THE PURPOSE OF FACILITATING THE MANUFACTURE OF UNGUENTUM HYDRARGYRI.

BY MR. J. WALTON.

Mr. James Fison (page 662, *Ph. Journ.*) states, that the rancid tallow obtained from candles which have been long kept (he particularizes London moulds) is identical with the prepared sævum. I have had extensive experience both of this and of a similar article "Nash's Magnetic Adeps," and have met with signal success in reducing by their means the time and labour usually requisite in making mercurial ointment. I feel satisfied that Mr. F. has come to too hasty a conclusion. Rancid tallow, or indeed rancid fat of any kind, will expedite the manufacture of this ointment, and it is probably to this cause that we are to attribute the beneficial results mentioned by Phillips in his notes on Mercurial Ointment, in his translation of the London Pharmacopœia of 1836, and found by experience to be produced by using a portion of old ointment to rub down the mercury when making a new quantity. The increased facility in making the ointment experienced by using adeps which has become partially oxygenized by exposure to the air, renders it a desirable object to find out some mode of imparting the same qualities artificially. This may be effected in the following manner:—To a pound of lard melted in an earthen vessel, add an ounce of strong nitric acid, and stir briskly for five minutes with a bone spatula. Then set aside to cool. When solid, pour off the nitric acid which has separated, and melt the lard again with four or five parts of water. Repeat this process, till the acid is completely washed off, which may be known by the taste and usual tests. The lard will be found to have acquired a firmer consistence, a granular appearance, and a somewhat rancid smell. Though containing no acid whatever, it has the property of oxydizing mercury with very great rapidity. I have enclosed a sample for your inspection, as it is of importance to the adoption of the practice, that

no acid should be proved to exist in the lard, which on examination, you will find to be the case. By employing the oxygenized lard, it is possible to make ointment as perfectly in a quarter of an hour, as by the old process in a day. I conceive this to be the preparation, the sævum before alluded to, undergoes, as the similarity in appearance and effects is exact.

6, *Broad Street, Bath.*

Mr. Redwood said, that in connection with the consideration of Mr. Walton's paper he took the opportunity of bringing under the notice of the meeting some lard, prepared according to a process to which he had alluded on a previous occasion. The process adverted to is as follows:—The lard is melted in an earthen pipkin, and while in the fluid state, poured in a thin stream from some height, into a vessel containing a considerable quantity of cold water. The lard diffuses itself in a thin stratum over the surface of the water: it is now to be collected and placed in a coarse hair sieve, and the top of the sieve to be covered with paper, to preserve it from the dust. In this state it should be kept in a dry apartment, exposed to the action of the air, for two or three months; at the expiration of which time it will be found to have acquired the property of readily combining with a very large proportion of mercury. This process was first suggested by M. Dorly, a French Pharmacien; and a specimen of lard thus prepared was exhibited to the Society of Pharmacy at Paris, some years back, which was stated to possess the power of killing thirty-two times its weight of mercury in a few minutes. He (Mr. R) had prepared some lard according to this process about three months ago, being desirous, in conjunction with his friend Mr. Bell, to elucidate further the phenomena connected with the preparation of mercurial ointment; and he now laid it before the meeting in the sieve in which it had remained since the 22d of April last. He begged at the same time to observe, that he was merely induced to submit it to the meeting on that occasion, in consequence of the subject having been brought forward by Mr. Walton. The experiments, of which this was intended to be one, were not yet completed, and this, therefore, must be considered only as one link of a chain of evidence intended to determine the question as to the oxidizement or merely mechanical division of mercury in some of its preparations. In order to exhibit the altered properties of the lard, he would put part of it, with thirty-two parts of mercury, into a mortar; into another mortar he would put the same proportions of ingredients, but substituting the lard prepared according to Mr. Walton's process, a portion of which

that gentleman had sent for examination; and into a third mortar would be put mercury and common unprepared lard in the same proportions. The trituration should be simultaneously commenced in the usual way, and the meeting would have an opportunity of observing the result.

The ingredients being weighed in the proportions of one part of lard and thirty-two parts of mercury, it was found that in four minutes the lard prepared in the manner described by Mr. Redwood had combined with the whole of the mercury; while little, if any, combination had been effected with the common lard; and in the case of the lard sent by Mr. Walton, although the effect was greater than with the common lard, yet a large portion of the mercury remained uncombined, even after the expiration of fifteen minutes, during which the friction was continued. It was now proposed that the mercury which remained uncombined with the common lard should be added to the mortar in which the combination had been completed, thus making the proportion of mercury in this case double, or sixty-four parts of mercury to one of lard prepared by the cold water process: the friction was continued, and in a very few minutes the combination was effected with this additional quantity of mercury.

Mr. Pedler thought the lard, during the process of preparation, acquired a firmer consistence, and that the increased facility experienced in effecting its combination with the mercury arose from this circumstance. He was decidedly of opinion that the combination was merely a mechanical one.

Professor Clark suggested, that probably a small quantity of water might be present in the lard prepared in the manner mentioned by Mr. Redwood, and that this might have some influence on the result. He thought the mechanical influence of increased tenacity in the lard, would, in some measure, account for the advantage which the prepared lard appeared to possess. He considered it evident that in the preparations of mercury under consideration, the metal was not in the state of protoxide, which may be proved by testing it with hydrocyanic acid.

Mr. Semple thought it might be inferred from analogy, that the metal was in a state of oxide, as it was well known that in the metallic state mercury may be taken in any quantities without any result, beyond that of mechanical action, and that other metals were equally inert, unless in a state of chemical combination.

The time for adjourning the meeting having arrived, the Chairman announced, that Dr. Pereira would deliver a Lecture* on recent Researches on the Nutritive Properties of Food, on the 27th instant.

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* The Lecture will be published in our next Number.—Ed.

DONATIONS TO THE LIBRARY.

		Presented by
James's Pharmacopœia Universalis	1752	Mr. Thomas Benson (Darlington)
Jourdan's Pharmacopœia Universalis, by Rennie, Parts 1 to 14	1831	Mr. T. Leech (Rochdale)
Monographie du Madi cultivé ou Madia sativa		M.V. Pasquier (Liege)
Schola Salernitata		Mr. Joseph Morgan
Ure's Dictionary of Arts, Manufactures, and Mines	1839	Mr. Waugh, (Regent Street)
Loudon's Encyclopædia of Plants	1836	
Smith's and Hooker's English Flora, 6 vols.	1828–33	
Stephenson's Medical Zoology and Mineralogy, with coloured plates, 2 vols.	1838	
Thenard's Essay on Chemical Analysis, by Children	1819	
Annals of Philosophy, 28 vols.	1813–26	
Berzelius on Animal Chemistry, by Brunnmark	1818	Mr. Thomas Benson
Mead on Poisons	1745	
Quincy's Dispensatory	1728	
Sauvages's Nosologia Methodica, 5 vols.	1763	
Journal de Pharmacie, for	1836, 1838, 1839	Mr. Davy, (Thames Street)
Journal de Chimie Medicale, for	1836-39	
Annales de Chimie et de Physique,	1838, and part of 1840	
Brooke's General Dispensatory	1765	Mr. Frank Triggs
Thomson's Conspectus of the Pharmacopœia,	1810	
Clarke's Conspectus of the Pharmacopœias	1810	
Crichton on General Principles of Safe Practice	1842	Sir Alex. Crichton, M.D.
Fourcroy's Elements of Natural History and Chemistry, 2 vols.	1790	Mr. Wm. Wilkinson, (Strand)

THE MUSEUM.

Glass cases and jars being now ready for the reception of Specimens, we hope to have a list of donations for publication next month.

THE BRITISH ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

At the late Meeting of this Association, a collection of Chemical and Pharmaceutical Specimens, amounting to about 400, arranged by Mr. Gilbert, was exhibited at the Chemical Section. Some of them had been sent from Germany by Dr. Merck, of Darmstadt, and presented to the Institution:—others were furnished by several Members of the Pharmaceutical Society.

We believe that no other efforts were made for the introduction of the subject of Pharmacy at the Meetings of the Association, but we may consider this beginning to be a favourable indication.

Dr. Liebig's work on Animal Chemistry, which was written for the purpose of presentation to the Association, was one of the most important and interesting contributions. It is reviewed in another part of this number.

MEDICINAL PLANTS,

WHICH SHOULD BE COLLECTED IN AUGUST, ARRANGED IN THE NATURAL ORDERS.

RANUNCULACEÆ. — Clematis *vitalba*. Common Traveller's Joy. A shrub found in hedges, on a calcareous soil, occasionally employed as a rubefacient in the treatment of rheumatism in domestic practice.

Ranunculus *flammula*, Lesser Spearwort Crowfoot, and R. *sceleratus*, Water Crowfoot. Both marsh plants, may be still gathered in this month. The former is distinguished from R. *gramineus*, Grassy Crowfoot, by the root consisting of long simple fibres, devoid of tubers, and the leaves being lanceolate, neither linear nor ribbed.

UMBELLIFERÆ.—Eryngium *campestre*. Field Eryngo. Not very common—found on waste ground near the sea. It is an indifferent tonic. The root is sold in the candied state.

Archangelica *officinalis*. Officinal Angelica, is not uncommon in moist and watery places. It is distinguished from A. *sylvestris*, Field Angelica, by the aromatic, pungent, resinous nature of its root, the striated surface of its stem, the ternate, tripinnate form of its leaves, the leaflets being partly decurrent, the odd one deeply three-lobed, and the whole free from down. The root, which is generally candied, is less bitter, and more aromatic, than that of wild Angelica. As an expectorant it is of little value. It may be gathered from June to September.

Peucedanum *officinale*, Hog's Fennel, is occasionally found in salt marshes, and is gathered by the common people, who consider its juice diuretic and anti-spasmodic; but it possesses poisonous properties, and is consequently hazardous in their hands.

Conium *maculatum*, Common Hemlock, may be collected, for the sake of its seeds, until the middle of September.

BERBERACEÆ. — Berberis *vulgaris*. Common Barberry. Although this shrub flowers in June, yet its fruit is not ripe until the middle of August, when it should be collected. When prepared as a conserve, it forms, with water, an agreeable and refreshing beverage in fevers.

CUCURBITACEÆ.—Bryonia *dioica*. Red-berried Bryony, very common in hedges and thickets. The berries, which are now ripe, are small, scarlet, juicy, and fœtid when bruised. The root is acrid and purgative, and although not officinal, yet has better claims to be received into the Pharmacopœia than many roots contained in it.

Momordica *Elaterium*. Squirting Cucumber. Although

this is an exotic, yet we have placed it among the plants to be gathered this month, in order to state our opinions respecting the proper time of taking the fruit, which is in general gathered too soon, from the dread that it may separate from the stem and the juice be lost. The proper time is immediately after the first pepo has been thrown off from its footstalk. In procuring the juice for the purpose of obtaining the elaterium, no pressure should be employed; for it is that only which surrounds the seeds that possesses the active principle of the preparation.

Linaceæ,—Linum *catharticum*. Purging Flax, is found in dry pastures. It is a smaller plant than L. *usitatissimum*, the leaves are in pairs, upright, obtuse, and bright green; the flowers in a forked panicle, white, and pendulous before expansion, and the petals acute and entire. The plant is now contained only in the Edinburgh and the Dublin Pharmacopœias. It is a certain and active cathartic, operating chiefly on the internal exhalants.

Malvaceæ. Malva *sylvestris*. Common Mallow. Under hedges and in waste ground. It is readily recognized by the leaves, which are of a deep green colour, soft and downy, serrated, plaited; the lower ones with seven acute lobes, the upper with fewer, but deeper and more acute than the lower. The flowers are numerous, of a shining pale purple colour, and veined.

Althæa *officinalis*. Marsh Mallow. The root, which is tap-shaped and rather woody, is now in the best condition for yielding the mucilage, which is its medicinal principle.

Lythraceæ.—Lythrum *salicaria*. Spiked purple Loosetrife, common in damp places and about the margins of ponds and ditches. In dry situations it loses its smoothness and dark green colour, and acquires a downy and even hairy character, and is less in height than in damp places. It is a good astringent.

Rhamnaceæ.—Rhamnus *catharticus*. Buckthorn. Found in woods and hedges. The fruit is a powerful, hydragogue-cathartic, but it operates with too much violence to be frequently employed. The unripe berries dye yellow.

Euphorbiaceæ.—Euphorbia *lathyris*. Caper Spurge. Found occasionally in dry woody thickets. Sir J. E. Smith imagines that it is probably a naturalized plant. It is a biennial—flowers in June and July, and continues flowering in this month. The plant rises about 3 to 4 feet high, the stem is strong, smooth, round, and glaucous, the leaves dark, glaucous-green, sessile, linear, oblong, somewhat coriaceous, bracts cordate, entire, tapering. The capsule is tricoccous, the seeds are obovate, truncated at the base, rough and brown. They contain an acrid purgative principle, which can be expressed along with a bland oil which they also contain; and, were the plant abundant, the expressed oil might

serve all the purposes of castor oil. It was ordered in the "*capitalaries*" of Charlemagne, to be grown in every garden, and as it grows readily, it might now be cultivated with advantage.

All the Euphorbias yield the same acrid principle as the officinal species, and Euphorbium might be procured from them. The indigenous species which are now in a condition fit to be gathered, are E. *peplis*, found on the sea coast in the south-west of England; E. *peplus*, a common weed in all cultivated grounds; E. *helioscopia*, also a common weed; E. *cyparissias*, found in thickets and barren places; E. *esula*, occasionally found in shady woods; E. *paralia*, on the sea coast, but not very common.

Rutaceæ.—Ruta *graveolens*. Common Rue. In gathering it, the panicle, with the ripening fruit, should be collected along with the leaves.

Rosaceæ.—Potentilla *tormentilla*, Tormentil, may be still gathered, and also Avens, Geum *urbanum* and Agrimony, Agrimonia *eupatorium*. The bark of the root of Rubus *villosus*, is employed as an astringent by the Americans; and the same property is found in that of the following indigenous species, which might now be gathered, R. *fruticosus*, common Bramble or Blackberry; R. *suberectus*, red fruited Bramble, sometimes found in woods and thickets.*

Spirea *ulmaria*, Meadow sweet, may still be gathered.

Rosa *canina*.—Dog-rose. The fruit of several other of our native roses is often mixed with the heps of the dog-rose, but none of them have the same agreeable flavour. The real hep is ovate, truncated in consequence of the fall of the sepals, bright scarlet, very succulent, and of a grateful flavour. The plant is a branched smooth bush, covered with equal hooked prickles, without any intermixture of setæ, the leaves are ovate, firm, without glandular pubescence, and serrated with converging teeth.

Genista *tinctoria*.—Wood Waxen, in pastures, thickets, and dry borders of fields.

Urticaceæ.—Humulus *Lupulus*. The Hop. The cultivated hop is generally preferred to the wild, but, if the latter be chosen, it is fit to be collected in this month. It is abundant in the hedge rows in Surrey.

Chenopodiaceæ.—Chenopodium *olidum*. Stinking goosefoot, found on waste grounds. The whole herb is collected and used by the common people as an antispasmodic; it has a dull grey-green colour, and is covered with a greasy mealiness, which

* A remnant of quackery is connected with one species of Rubus, namely, the Hazel-leaved, R. *coryfolius*, the barren shoots often arch and root at the apex. Children with the hooping-cough are drawn through such an arch, as a cure for their disease.

communicates to the fingers an odour not unlike that of stale fish.

Atriplex *angustifolia*.—Oak leaved goosefoot, found in waste grounds on a sandy soil. It is distinguished from some of the genus *Chenopodium*, chiefly by its purplish-black minutely dotted seeds, which are emetic.

Ericaceæ. Arbutus *Uva Ursi*. Red Bearberry, found on dry, stony heaths. The leaves are often mixed with those of Whortleberry, which, however, are easily recognised by their dotted undersurface, which is reticulated in Uva Ursi. The box leaf is also occasionally used to adulterate Uva Ursi : it is more coriaceous than that of Uva Ursi, and the cuticle of the under disk is easily stripped off.

Aquifoliaceæ.—Ilex *Aquifolium*. Common Holly. The leaves of the holly have been found to possess antiperiodic properties. They should be collected in this month.

Asteraceæ.—Inula *helenium*, Elecampane, may still be gathered.

Anthemis *nobilis*. Common Chamomile, is found wild in meadows and on commons. Although it is usually cultivated, yet the wild is preferable, as the active principle resides in the tubular florets, which are changed into the ligulate by cultivation. The flower-heads should not be larger than those of a daisy, with a convex full yellow disk, and white ray florets. The disk florets are interspersed with the scales of the receptacle, hid by the florets, but, when examined, they are thin and membraneous, not sharp.

Ptarmica *vulgaris*. Sneeze-wort Yarrow, found in wet thickets, and on the banks of rivers.

Artemisia *absinthium*. Common Wormwood. On waste grounds. The dry powdered leaves have lately been advantageously prescribed in symptomatic epilepsy. It is a useful tonic, well adapted, from its cheapness, to hospital practice.

Tanacetum *vulgare*. Common Tansy. Found in hilly pastures and hedge-rows; but it is commonly cultivated for medicinal use.

Cynaraceæ.—Arctium *lappa*. Burdock. Waste places. The root is tonic and aperient; its decoction is an excellent vehicle for the arsenical solution in lepra.

Cichoraceæ. — Lactuca *virosa*. Strong-scented Lettuce, found under hedges, and on the skirts of fields. It should be distinguished from L. *scariola*, prickly Lettuce and L. *saligna*, least Lettuce, with which it is often confounded. The stem is single, scarcely branched, sparingly leafy, and only a little prickly below ; the leaves are horizontal, smooth, finely toothed ; those near the root, numerous, obovate, undivided; those of the

stem often lobed, amplexicaul, the midribs and lateral ribs beset with numerous prickles, which are sometimes also seen on the margin. The bracts, on the panicle of flowers, small, cordate, and pointed. The corolla is small, and of a pale yellow colour.

Cichorium *intybus*. Wild Succory. Waste places, road sides, and borders of fields, on a gravelly soil. The roasted and ground root is now permitted to be mixed with coffee. It is tonic.

Solanaceæ.—Hyoscyamus *niger*, Datura *stramonium*, and Atropa *belladonna*, may still be gathered.

Solanum *dulcamara*. Bitter sweet. Is in the proper state to be gathered at the close of the month.

Gentianaceæ. — Erythræa *centaurium*, found on dry gravelly pastures. The whole plant should be collected, and carefully dried. The flowers are the most active parts.

Menyanthes *trifoliata*. Buckbean, is still in flower, and fit to be gathered. It is an admirable tonic in the debility left by acute rheumatism.

Melanthaceæ.—Colchicum *autumnale*, may be still taken up for the cormus; and the petals may now be gathered; they are as active as the seeds.

ON THE DYNAMICS OF CHEMISTRY.*

BY MR. WILLIAM BITTLESTON.

The object of the author in this paper, is to show, that the chemical attraction of bodies, such as the metals, sulphur, azote, &c. &c., is analogous to the general law of attraction or dynamics, which is in the direct ratio of the mass, and in the inverse of the distance. For instance, if density is admitted to express the relative distances of the contained moleculæ of bodies, it will follow that the squares of the densities will be the same relatively, as the squares of the distances of the moleculæ; such, for instance, as in the isomorphous crystals, where the moleculæ are the most equiangularly arranged, the distances will be the most equal and the most easily comparable—that is the squares of their densities will be in ratios to the elements that vary in the isomorphous crystals, or in the ratio of their variable elements; the varying elements will thus express the controlling or dynamical masses, and the densities the relative distances. Now, as the densities of bodies are, or can be shown to be, in the

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* This paper was originally intended for the late meeting of the British Association of Science at Manchester, but it was not ready in time.

direct ratios of the amount of matter contained within them, that is, in the same space, according to the difference in their respective weights, or in other words, in the inverse ratios of their respective bulks, so will the squares of those densities, on the same principle, be also relatively in the inverse ratios of the distances of their contained moleculæ; and, consequently, if it can be shown by squaring the densities of the isomorphous crystals, those being the most simple of comparison from the equable distance of their contained moleculæ, that the variable elements in them are found to be in ratios, to the squares of their respective densities, or, which is the same, to the squares of the relative distances of their contained moleculæ, when compared to each other; it is presumed that the general law of dynamics or attraction, as before cited, which is in the ratio of the mass, and in the inverse of the distance, and the dynamical law of Chemistry will be shown to be analogous, without pretending to say they are the same in principle. Our want of knowledge of the essence or principle of dynamism itself, is such as to render the saying of such a thing impossible, though the author of this paper believes, that as all power must have emanated from the Creator himself, however it may be displayed to us in different ways, its source is at least unique, and always the same. The tables below are the illustrations of the law, and the different authorities for the densities are given with them.

NITRATES OF STRONTIA, LEAD, AND BARYTA.

	Variable Elements.		Densities.
$N_2 O_6 + Sr =$	44	Hasenfratz	3.006
		Karsten ..	2.890
			$2 \div 5.896 = 2.948^2 = 8.690$
$N_2 O_6 + Pb =$	104	Breithaupt	4.769
		Karsten ..	4.400
			$2 \div 9.169 = 4.584^2 = 21.013$

va. el. sq. den.
Strontium to Lead, 44 : 104 :: 8.690 : 21.013

THE BARYTA.

$N_2 O_6 + Ba =$	68	Karsten ..	3.185
		Hasenfratz	2.915
			$2 \div 6.100 = 3.05^2 = 9.302$

va. el. sq. den.
Strontium to Barium (44+22=) 66 : 68 :: 8.690 : 9.302

It will be found, that in certain instances, as in this, the ratios vary, as $\frac{1}{2}$, $\frac{1}{3}$, or $\frac{1}{4}$, as is always the case, where the de-

finite proportions are concerned. One portion of the chemical elements, as the gases, and the lighter metals, condense, and the heavier metals expand, generally in combining, but in ratios to the variable elements or controlling mass, as in this of the strontia. The gases condense or expand in multiple volumes, as discovered by Gay Lussac, in the same manner as the solids or minerals are here found to do. In fact, it is an exemplification of a similar law, only applicable to the solids instead of the gases.

NITRATES OF SODA AND SILVER.

	va. el.		den.	
$N_2 O_6 + Na =$	24	Klaproth..	2.096	
		Marx.....	2.188	
		Kopp.....	2.200	
		Karsten....	2.256	
			$4 \div 8.740 = 2.185^2$	$= 4.742$
$N_2 O_6 + Ag =$	108	Karsten	4.355^2	$= 18.966$

Sodium to Silver, 24 (va. el.) : 108 (va. el.) :: 4.742 (sq. den.) : 18.966 (sq. den.) nearly.

While the law evidently holds good, the differences in the densities are amply sufficient to account for some discrepancy in the ratios in this instance.

The densities are generally the same as M. Kopp has used for his comparison of the atomic volumes of the isomorphous crystals; for a good reason, that he has mustered every authority nearly on the subject, so that what was required, was simply to go over the authorities again, and see they were correct, which has been done by the author of this in very nearly every case.—*See note on M.M. Schroeder and Kopp's paper.*

NITRATES OF AMMONIA AND POTASH.

	va. el.		den.	
$N_2 O_6 + K =$	40	Karsten ..	2.101	
		Kopp	2.058	
		Watson ..	1.933	
			$3 \div 6.092 = 2.030^2$	$= 4.120$
$N_2 O_6 + N_2 H_8 =$	18	Kopp	1.707	
		Hasenfratz	1.579	
			$2 \div 3.286 = 1.643^2$	$= 2.691$

Potassium to Ammonium, 40 (va. el.) : 27 (=18+9) (va. el.) :: 4.120 (sq. den.) : 2.691

SULPHATES OF SILVER AND SODA.

	va. el.		den.	
$SO_4 + Ag$	=108	Karsten ..	5.341^2	=28.526
$SO_4 + Na$	= 24	Mohs	2.462	
		Karsten ..	2.631	
			$2 \div 5.093 = 2.546^2$	= 6.482

	va. el.		sq. den.
Silver to Sodium,	108	: 24 : :	28.526 : 6.482

SULPHATES OF BARYTA, STRONTIA, AND LEAD.

	va. el.		den.	
$SO_4 + Ba$	= 68	Mohs	4.460	
		Karsten ..	4.200	
			$2 \div 8.660 = 4.33^2$	=18.748
$SO_4 + Pb$	=104	Karsten ..	6.169	
		Mohs	6.298	
			$2 \div 12.467 = 6.233^2$	=38.350
$SO_4 + Sr$	= 44	Breithaupt	3.588	
		Karsten ..	3.588	
			$2 \div 7.176 = 3.588^2$	=14.212

	va. el.		sq. den.
Barium to Lead	(68—17=) 51	: 104 : :	18.748 : 38.850
Strontium to Lead	44	: 104 : :	14.212 : 38.850

SULPHATE AND CHROMATE OF POTASH.

	va. el.		den.	
$KO_4 + S$	= 16	Kopp	2.662	
		Watson ..	2.636	
		Karsten ..	2.623	
			$3 \div 7.921 = 2.640^2$	= 6.969
$KO_4 + Cr$	= 32	Kopp	2.705	
		Thompson	2.612	
		Karsten ..	2.640	
			$3 \div 7.957 = 2.652^2$	= 7.033

Sulphur to Chromium (16 + 16=) 32 : 32 : : 6.969 : 7.033

See Annales de Chemie, December, 1840, and April, 1842; or, Phil. Mag., April, 1841, and March, 1842.*—*M. Kopp's papers.*

* Some observations, perhaps, may be as well here to place in contradistinction the different views of M.M. Schroeder and Kopp, and my own. Those Chemists have shown, that the atomic volumes of the isomorphous

THE CRYSTALLIZED SULPHATES OF ZINC, MAGNESIA, AND NICKEL.

	va. el.		den.	
$S O_4 + 7 H_2 O +$ Nk	32	Kopp	2.037^2	$= 4.149$
$S O_4 + 7 H_2 O +$ Zn	32	Mohs	2.036^2	$= 4.145$
$S O_4 + 7 H_2 O +$ Mg	12	.....	1.751	
			1.674	
			$2 \div 3.425 = 1.712^2$	$= 3.066$

	va. el.		sq. den.
Nickel to Zinc	32	: 32 : :	4.149 : 4.145
Zinc to Magnesium,	32	: 24 (=2×12)	4.149 : 3.066

THE CRYSTALLIZED SULPHATES OF COPPER AND MANGANESE.

	va. el.		den.	
$S O_4 + 5 H_2 O +$ Cu	32	Gmelin ..	2.274	
		Kopp	2.200	
			$2 \div 4.474 = 2.237^2$	$= 5.004$
$S O_4 + 5 H_2 O +$ Mn	28	Bittleston	2.100^2	$= 4.410$

	va. el.		sq. den.
Copper to Manganese,	32	: 28 : :	5.004 : 4.410

crystals are, in most cases, equal to each other; and I have here shown there is a given relation between the squares of their densities and their various elements, which latter alone can make the difference in a dynamical point of view, or explain the law in a chemical one, as it must otherwise be confused, unless the mass, or the controlling element or power, is distinguished by isolating it from the other elements. Now, as the relation of the atomic volume of a whole crystal to the atomic volume of another whole crystal, which is their view, does not, and cannot, isolate any one element from another, consequently the dynamical or controlling element, the essence or principle of the comparison, in a dynamical point of view, does not exist in their comparison, and, therefore, the influential element, the cause of the dynamism, remains unexplained in theirs. Neither is their view the same as mine in principle, as may be shown; for theirs is a comparison between all the elements in combination and the simple density, and mine is a comparison between only one element of the combination and the square of the density; mine contains the law of dynamics, expressed in the very process itself, as is shown all through my paper, and announced in the law at the beginning; theirs does nothing of the sort; and consequently, as might be expected, in many cases, our two different views produce comparatively different results to what they do in other cases, which, were they the same in principle, it is presumed such a thing would be impossible. All that I wish here is, not to underrate, but simply to show their view cannot be substituted for mine, as they are essentially distinct; theirs giving only the relation of the volumes of the compound molecules, while mine proves the dynamical law on the isolated molecule, that has determined the compound volumes themselves, and it is this very circumstance that, in some respects, tends to make them appear similar, when in reality that is not the case.

THE CHLORIDES OF BARIUM, STRONTIUM, AND LEAD.

	va. el.		den.	
Cl_2 + Ba =	68	Boullay ..	3.860	
		Karsten ..	3.704	
		2 ÷ 7.564 =	3.782^2 =	14.899
Cl_2 + Sr =	44	Karsten ..	2.803^2 =	7.856
Cl_2 + Pb =	104	.....	5.802	
			5.682	
		Monro....	5.238	
		3 ÷ 16.722 =	5.574^2 =	31.069

	va. el.		sq. den.
Barium to Strontium,	68 : (44—11=) 33	::	14.899 : 7.856
Strontium to Lead	(44—15=) 29 : 104	::	7.856 : 31.069
Barium to Lead....	(68—17=) 51 : 104	::	14.899 : 31.069

THE CHLORIDES OF SODIUM AND SILVER.

	va. el.		den.	
Cl_2 + Na =	24	Karsten ..	2.078	
		Kopp	2.150	
		2 ÷ 4.228 =	2.114^2 =	4.6225
Cl_2 + Ag. =	108	Karsten ..	5.501	
		——— ..	5.458	
		Herapath..	5.130	
		3 ÷ 16.089 =	5.363^2 =	28,761

	va. el.		sq. den.
Sodium to Silver	(24—6=) 18 : 108	::	4.6225 : 28.761

THE CHLORIDES OF POTASSIUM AND AMMONIUM.

	va. el.		den.	
Cl_2 + K =	40	Karsten ..	1.915	
		——— ..	1.945	
		2 ÷ 3.860 =	1.930^2 =	3.7249
Cl_2 + N_2 H_8 =	18	Mohs	1.528	
		Watson ..	1.450	
		2 ÷ 2.978 =	1.489^2 =	2.2173

	va. el.		sq. den.
Potassium to Ammonium,	40 : 24 (=18+6)	::	3.7249 : 2.2173

CARBONATES.

ARRAGONITE, STRONTIANITE, WITHERITE, AND CARBONATE OF LEAD.

	va. el.		den.		
$C O_4 + Ca$	=20	Breithaupt	2.995		
		Mohs	2.931		
			2÷5.926	$=2.963^2$	= 8.779
$C O_4 + Sr$	=44	Karsten ..	3.625		
		Mohs	3.605		
			2÷7.230	$=3.615^2$	=13.068
$C O_4 + Ba$	=68	Mohs	4.302		
		Karsten ..	4.301		
			2÷8.603	$=4.301^2$	=18.490
$C O_4 + Pb$	=104	Karsten ..	6.428		
		Mohs	6.465		
			2÷12.893	$=6.446^2$	=41.761

	va. el.			sq. den.
Calcium to Strontium	(20+10=) 30	:	44 ::	8.779 : 13.068
Barium to Strontium.....	68	:	44 ::	18.490 : 13.068
Calcium to Lead.....	20	:	104 ::	8.779 : 41.761

TENNANTITE AND BLACK COPPER.

	va. el.		den.	
$Cu_6 S_6 As_2$	As=37	Phillips....	4.375^2	=19.140
$+ 2 (Cu_6 S_6 As_2)$	Cu=32			
$Cu_6 S_6 Sb_2$	Sb=64	Mohs	5.736^2	=33.212
$+2 (Pb_3 S_6 Sb_2) \frac{1}{2}$	Pb=52			

	va. el.			sq. den.
Arsenic to Antimony,	37	: 64	::	19.140 : 33.212
Copper to Lead	32	: 52	::	19.140 : 33.212

THE CRYSTALLIZED DOUBLE SULPHATES OF POTASH OR AMMONIA AND MAGNESIA, COPPER, MANGANESE, ZINC, AND NICKEL.

	va. el.		den.		
$S O_4 + 6 H_2 O + Mg$	12	Thompson	1.721		
$S O_4 + N_2 H_8$	18	Gmelin....	1.696		
	30		2÷3.427	$=1.713^2$	= 2.934
$S O_4 + 6 H_2 O + Cu$	32	Kopp.....	1.757^2		= 3.087
$S O_4 + N_2 H_8$	18				
	50				

	va. el.			sq. den.
Magnesium and Amm. to Cop. and Amm.	(30+20=) 50	: 50	::	2.934 : 3.087

	va. el.		den.	
$S O_4 + 6 H_2 O + Cu$	32	Kopp.....	2.137^2	$= 4.566$
$S O_4 + Ko$	40			
	72			
$S O_4 + 6 H_2 O + Zn$	32	Kopp.....	2.153^2	$= 4.635$
$S O_4 + K$	40			
	72			
$S O_4 + 6 H_2 O + Ni$	32	Kopp ..	2.111	
$S O_4 + K$	40		2.136	
	72		$2 \div 4.247 = 2.123^2$	$= 4.507$

	va. el.		sq. den.
Copper to Zinc, as	72	: 72 : :	4.566 : 4.635
Nickel to Zinc, as	72	: 72 : :	4.507 : 4.635

ORPIMENT AND ANTIMONY GLANCE.

	va. el.		den.	
$S_3 + Sb_2\ Sb$	=68	Breithaupt ..	4.626	
		Mohs	4.620	
		Musschenbrock	4.850	
			$3 \div 14.096 = 4.698^2$	$= 22.071$
$S_3 + As_2\ As$	=37	Mohs	3.480	
		Karsten	3.459	
		Musschenbrock	3.313	
			$3 \div 10.252 = 3.417^2$	$= 11.765$

Antimony to Arsenic, 68 : 37 : : 22.071 : 11.675

COPPER GLANCE AND SILVER COPPER GLANCE.

	va. el.		den.	
$S\ Cu^2\ Cu$	=32	Mohs	5.695	
			5.735	
			$2 \div 11.430 = 5.715^2$	$= 32.661$
$S\ Cu + Ag\ Ag$	=108	Stromeyer	6.255^2	$= 39.125$

	va. el.		sq. den.
Copper to Silver ($32 \times 3 =$)	96	: 108 : :	32.661 : 39.125

It should be observed, that the densities of most mineral substances are apt to be incorrect, from the mixture of other substances with them, and, therefore, the approximations will be less close in proportion.

TITANIC ACID AND OXIDE OF TIN.

		va. el.	den.	
O_2 + Ti = 28	Breithaupt		3.759	
	Mohs		3.826	
		2 ÷	7.585 = 3.792^2	= 14.379
O_2 + Sn = 60	Mohs		6.960^2	= 48.441

Titanium to Tin, 28 : (60+30) = 90 :: 14.379 : 48.441 (va. el. : sq. den.)

APATITE AND GREEN LEAD ORE AND BROWN LEAD ORE.

		va. el.	den.	
3 (Ca_3 O_8 P_2) + Cl_2 Ca 20	Naumann		3.150	
			3.250	
	Mohs		3.225	
		3 ÷	9.625 = 3.208^2	= 10.291
3 (Pb^3 O_8 P_2) + Cl_2 Pb 104	Karsten ..		7.050	
	Naumann		7.200	
		2 ÷	14.250 = 7.125^2	= 49.350

Calcium to Lead, 20 : 104 :: 10.291 : 49.350 (va. el. : sq. den.)

Pb Cl_2 3 (Pb_3 O_8 As^2)	Mohs		7.208	
As = 37	Naumann		7.200	
		2 ÷	14.408 = 7.204^2	= 51.897

Arsenic to Lead, 37 × 3 = 111 : 104 :: 51.897 : 49.350 (va. el. : sq. den.)

OLIVENITE AND LIBETHENITE.

		va. el.	den.	
Cu_4 O_9 2 (H_2 O) + As = 37	Bournon ..		4.281^2	= 18.490
Cu_4 O_9 2 (H_2 O) P + = 16	Mohs		3.600	
			3.800	
		2 ÷	7.400 = 3.700^2	= 13.690

Arsenic to Phosphorus, 37 : 28 (=16+12) :: 18.490 : 13.690 (va. el. : sq. den.)

DIOPSIDE AND HYPERSTHENE.

		va. el.	den.	
Si_2 O_4 Ca_3 } Si_2 O_4 Mg_3	Ca = 20 Mg = 12	Mohs	3.006	
		Ditto	3.127	
	32	2 ÷	6.133 = 3.066^2	= 9.389
Si_2 O_4 Mg_3 Te = 28 } Si_2 O_4 Fe_3 Mg = 12 }	40	Mohs	3.389^2	= 11.485

Calc Mag to Iron and Mg, 32 : 40 :: 9.389 :: 11.485 (va. el. : sq. den.)

	va. el.		den.	
$Si_2 O^4 Fe^3 Fe$	=28	Breithaupt	3582^2	=12.830
$Si_2 O^4 Ca_3 Ca$	=20			
	48			

	va. el.		sq. den.	
Ca Mg to Fe Ca	: 32	: 48	: 9.389	: 12.830

Another instance is added to show that liquids follow a somewhat different law in appearance, though in principle the same, as the isomorphous bodies, as will be seen.

CHLORIDES OF ÆTHYL.

(*Liebig's Organic Chemistry*, vol. i. pp. 322 & 429.)

$C_4 H_{10} Cl_2$	= 65		0.874^2 =0.7638
$C_4 H_8 Cl_4$	=100	Regnault ..	1.174^2 =1.3782
$C_4 H_6 Cl_6$	=135		1.372^2 =1.8823
$C_4 H_4 Cl_8$	=170		1.530^2 =2.3409
$C_4 H_2 Cl_{10}$	=205		1.644^2 =2.7029
$C_4 Cl_{12}$	=240	Faraday ..	1.743^2 =3.0379

If the first and the last are found to be in ratios, as they increase regularly, the intermediate will be so. But from the first the hydrogen must be deducted, as not existing in the last;

That is (65—5 H_2 =) 60 : 240 : : .7638 : 3.0379

Nothing can illustrate the law more than this does; and could the chlorides of æthyl be crystallized, there is no doubt of their being isomorphous. But one thing, the whole atom, in liquids, requires comparison; while in the solids, the variable element alone was sufficient.

I consider I have shown in these examples, embracing as they do, a great proportion of the chemical substances, that the relation of the squares of the densities to the variable elements is too frequent, approximates too closely to be the result of hazard, and consequently that there must exist a law to that effect, whereby the densities of substances are regulated and controlled. I could have given a considerably greater number of examples, but I thought as these establish the point they would be sufficient.

July 14, 1842.

CARBONATE OF POTASH WITH GUM RESINS.

TO THE EDITOR OF THE PHARMACEUTICAL JOURNAL.

Sir,

In reference to the subject of Mr. Hulse's highly useful paper, on the Action of Carbonate of Potash on Gum Resins, it may not be inexpedient to remark, that the *salt of tartar* forms a

very general ingredient in the pill masses containing gum resins, as well as in a variety of tinctures of a similar nature that are given in the formulæ of the old dispensatories.

In the Doron Medicum of Salmon, published 1683, the work of an empiric, but certainly a most interesting book to those who would trace the progress of Pharmacy, we find that salt of tartar enters into the composition of Rufus' pill, and is likewise introduced as an ingredient into a large proportion of his prescriptions that depend on gum resins for their activity; two formulæ are given for the preparation of Elixir Proprietatis, one with and one without the salt.

In the eighth edition of Quincy's Dispensatory, 1730, a book of far higher character than Salmon's, the salt of tartar enters very generally into the preparations that contain gum resins; but the author observes, in reference to the pilulæ ecpracticæ and pil. de ammoniaco magistralis, that a great deal of pains is required to bring the mass to a due consistence, *because the salt so much disposes it to crumble.* It is worthy of notice also, that the Elixir Antevenereum, much extolled by Quincy, and said to be the nostrum called Wessel's Jesuit's Drops, contains guaiacum and salt of tartar.

The practical value of Mr. Hulse's paper is two-fold: in the first place, it shows the peculiar power of carbonate of potash in promoting the solubility of gum resins in a very forcible manner. In the next, it developes an easy means of combining this alkaline carbonate with the gum resinous mass, so that it no longer disposes it to crumble. These are no trifling advantages; and, although the former has been known from a very early period, and illustrated daily in the Dec. aloes co. and Mist ferri co. the peculiar aptitude of *raw* sugar for combination with the salt in gum resinous pill masses, is certainly a novelty.

There can, I think, be little doubt that the discontinuance of the salt of tartar as an adjunct to the gums in pilular form had its origin in the complaint alluded to by Quincy, of its tendency to cause a want of tenacity, and as it would seem from the recognition of the principle by the College at the present day in the Dec. aloes co., &c. that the agency of the carbonate of potass is considered advantageous; it is but fair to assume that the means for extending its action must be acceptable to practitioners generally and an improvement of considerable utility.

I am, Sir, your obedient servant,

BENJAMIN ORRIDGE.

Deptford, July 12*th*, 1842.

PREPARATION OF CYANIDE OF POTASSIUM.

BY M. LIEBIG.

One of the best methods of preparing the cyanide of potassium, consists, as is known, in the decomposition of the ferro-cyanide of potassium at a red heat; but several objections attach to this process, one of which is that a loss takes place of a third of the cyanogen contained in the salt employed. This salt formed of two atoms of cyanide of potassium and one atom of cyanide of iron, undergoes no change from a red heat in the first member of the combination; but the second is decomposed into carburet of iron with disengagement of nitrogen. The carburet of iron which is formed, absorbs the fused cyanide of potassium like a sponge, and we are obliged to have recourse to solvents, and alcohol in particular, to obtain the resulting cyanide of potassium without iron and without loss.

But as cyanide of potassium possesses properties which are found to be extremely valuable in effecting reduction and separation in chemical analysis, I have endeavoured to simplify its preparation.

If eight parts of ferro-cyanide of potassium be well dried, by a slight calcination, on a hot iron plate; if this be afterwards well mixed, in fine powder, with three parts of dry carbonate of potash, and the mixture thrown at once into a Hessian crucible, previously raised to a dull red heat, and this temperature maintained, the mixture will first melt into a brown magma, with rapid disengagement of gas; in a few minutes afterwards, when the fluid mass has been heated to redness, the dark colour will be seen to become brighter, and by continuing the fusion the contents of the crucible will become of a clear amber yellow. If a warm glass rod be introduced from time to time, the portion which adheres to it, when withdrawn and allowed to solidify, will at first be of a brown colour; it will afterwards become yellow; and, lastly, at the end of the operation, the liquid which adheres to the glass rod, will be clear and colourless like water, and will set into a crystalline mass of a brilliant white.

During the fusion, there will be seen floating in the fluid mass some brown flakes, which ultimately unite in the form of a sponge, and assume a clear grey colour. If the crucible be now taken from the fire, and allowed slightly to cool, it generally happens that this grey powder settles entirely to the bottom; the deposition may be facilitated by agitating it once or twice with the glass rod. The hot and melted mass which swims on the surface may now be easily decanted into a warm porcelain capsule, without the least portion of the powder, which has settled to the bottom, passing with it.

The mass, thus separated from the iron by decantation, will contain two combinations. It will principally consist of cyanide of potassium; the other combination will be cyanate of potash. These two will be found in the proportion of five atoms of cyanide of potassium to one of cyanate of potash.

The following changes take place during the fusion of ferro-cyanide of potassium with carbonate of potash:

In the commencement of the fusion, the cyanide of iron of the ferro-cyanide of potassium is decomposed with the potash of the carbonate of potash into cyanide of potassium and carbonate of protoxide of iron, from which latter the cyanide of potassium, at a higher temperature, takes the whole of the oxygen. In consequence of this reduction there will be obtained cyanate of potash and pure metallic iron.

If we suppose the mixture to contain two atoms of ferro-cyanide of potassium, and two atoms of carbonate of potash, it will be represented by the following formula:—

Ferro-cyanide of Potassium. Carbonate of Potash.

$$Cy_{12}\,Fe_2\,K_4 + K_2\,O_2\,2\,CO_2 = Cy_{12}\,Fe_2\,K_6\,O_2\,2\,CO_2$$

And after the fusion we shall have—

Cyanide of Potassium. Cyanate of Potash. Iron. Carbonic Acid.

$$Cy_{13}\,K_5 + Cy_2\,O,\,KO \quad Fe_2 \quad 2\,CO_2$$

We obtain from two atoms of ferro-cyanide of potassium, five atoms of cyanide of potassium, consequently one-fourth more than by the fusion of that salt alone at a red heat. The cyanate of potash, with which it will be mixed, will not interfere with any of its uses; its presence will be easily detected by saturating the cyanide of potassium with an acid; it will give rise, in fact, to an effervescence caused by the disengagement of carbonic acid, and there will be found in the solution an ammoniacal salt.

The explanation of the formation of cyanide of potassium under the conditions indicated is not quite clear, because the carbonate of protoxide of iron which is formed, is decomposed before the reduction of the iron and separation of carbonic acid into carbonic oxide and ferroso-ferric oxide; and it is at the expense of these, that an indeterminate quantity (at the most that which is indicated in the preceding formula) of cyanate of potash is formed.

The remaining metallic iron, as well as the sides of the crucible, are covered with cyanide of potassium: the best way to recover this, is to dissolve it in hot water, and to heat the solution with a small quantity of sulphuret of iron, which will readily dissolve. The cyanide of potassium may be obtained from this solution by evaporation, in the state of ferro-cyanide; sulphuret of potassium will remain in the mother-water.—*Annalen der Chimie und Pharmacie.*

PREPARATION OF PERCHLORIC ACID.

BY M. AD. NATIVELLE.

Perchloric acid, so valuable as a reagent, is seldom met with in our laboratories. This arises no doubt from the small quantity of the acid which is obtained by using the proportion of sulphuric acid generally directed in books, rather than from any difficulty in the operation, which in itself, is sufficiently simple. It is merely necessary, as is known, to introduce into a glass retort, one part of perchlorate of potash with half its weight of sulphuric acid diluted with a third part of water, and apply heat to obtain the perchloric acid, much diluted it is true, and in very small quantity in proportion to that of the perchlorate employed. On examining the phenomena which take place in this operation, it will be observed, that the water employed to dilute the sulphuric acid, first passes over without any acidity, and although at this period of the operation, the contents of the retort are in active ebullition, nearly the whole of the perchlorate remains undissolved. It is not until a subsequent period, when the sulphuric acid has regained its original concentration, that a part of the perchlorate begins to be decomposed, but as the proportion of sulphuric acid is much too small for the perchlorate of potash used, the distillation proceeds very slowly, and a part of the free perchlorate is decomposed by the heat, as it would be if alone, into oxygen and chlorate of potash. This chlorate, aided by the action of the heat and the surrounding acid, is easily decomposed into oxygen and oxide of chlorine, and even chlorine. These gases are disengaged during the continuance of the operation, and if at the end of the process, the residue contained in the retort be examined, a large proportion of the perchlorate will be found unacted upon. As for the product of the distillation, as I have already stated, it is but slightly acid, especially if the precaution has not been adopted of rejecting the portion first distilled over, which is nothing but pure water.

Notwithstanding the very diluted state of the perchloric acid obtained in this way, still it re-acts very well on the salts of potash ; it is this probably that has led to the belief, that the whole of the salt contained in the retort had been decomposed, and that the perchloric acid obtained, represented pretty nearly the salt employed, which is far from being the case, independent of the partial decomposition of the perchlorate into its elements by the mere action of the heat.

If the operation be well observed, it will be seen that the water added to the sulphuric acid, is useless, or nearly so, and that the quantity of sulphuric acid is insufficient for the decomposition of the whole of the perchlorate ; because here, contrary to the ordinary law of substitutions, the influence of mass, a sort of union of forces, if I may be allowed the expression, is required to overcome the pre-existing affinity ; the perchloric acid being capable, under certain circumstances, to displace the sulphuric. Having arrived at this point, it only remained to determine the proportion of sulphuric acid necessary to decompose the whole of the perchlorate. This proportion I will now give, and although at first sight, it may appear arbitrary, it is nevertheless indispensable for obtaining the whole of the perchloric acid.

Introduce into a glass retort, 500 parts of perchlorate of potash, deprived as much as possible of any chlorate, and reduced to powder ; add 1000 parts of sulphuric acid at 66° free from nitric acid ; then add 100 parts only of distilled water. This small quantity of water is not indispensable, for it will be seen further on, that by omitting it, the perchloric acid is immediately obtained in the solid form, in crystals. Fit to the retort a long adapter, terminating in a tubulated receiver, surrounded with cold water. It is

necessary to avoid luting the apparatus with paper, or any other organic substance, for this, when heated and in contact with the vapours of perchloric acid, would soon cause a decomposition, accompanied with slight detonations: if the apparatus be well adjusted, the use of lutes may be avoided, but if found necessary, a little asbestus will answer the purpose. On carefully applying heat, the whole of the perchlorate will soon dissolve, and some management will be necessary, in regulating the heat, to prevent a quantity of sulphuric acid, from passing over in the distillation. The best way to regulate the operation, is to avoid ebullition, by always keeping the heat a little below that point. In this way very little sulphuric acid will pass over, and this may be known, for perchloric acid rises in vapour at 316° Fah., a temperature much below that at which sulphuric acid distils. It may be ascertained that the operation is terminated by the residue in the retort being quite transparent and yet colourless, or still better, by the drops coming over slowly, although the temperature is nearly sufficient to carry over the sulphuric acid. The quantity resulting from the distillation, will vary in each operation, according to the manner in which the process has been conducted; this difference depending upon the greater or less quantity of sulphuric acid, which is carried over in the distillation. As an average, the above process, conducted with care, yielded 300 parts of impure acid of about 45° density from the quantity specified of perchlorate. Should the operation be conducted too fast, the density of the impure acid will be nearly that of sulphuric acid, and the quantity equal to the perchlorate employed.

It is very easy to render this acid pure, by removing the sulphuric acid and the small quantity of chlorine which it contains. For this purpose, it is first to be shaken with a slight excess of a saturated solution of sulphate of silver; the chlorine will be precipitated with the silver; this precipitate is to be separated with a filter, and the acid put into a large capsule; hydrated carbonate of baryta, prepared artificially and well washed, is now to be added until the whole of the sulphuric acid has been thrown down, and a small quantity of perchlorate of baryta formed; the precipitate is again to be separated by a filter. The liquor will now contain nothing but perchloric acid, combined intentionally, with a small quantity of the perchlorates of silver and baryta. It is next to be placed in a tubulated retort, and distilled by a gentle heat with the same apparatus as that used in the previous operation, and with the same precautions as before. As the liquor which first distils over is merely water, it should be received into a capsule, and the receiver should not be adapted until it has been ascertained by means of test-paper, that the acid is coming over. In general, the more slowly the operation is conducted, the less water will be retained in the retort, and the greater the density of the acid. It is well to put a few pieces of ice into the water used for cooling the receiver. The distillation may be carried on almost to dryness, always taking care to avoid the decomposition of the perchlorates of silver and baryta, which should remain as the residue. The perchloric acid thus obtained is perfectly pure, colourless, and transparent, its density varies from 60° to 65°, it is oleaginous, like sulphuric acid. From 500 parts of pure perchlorate of potash, I have obtained 150 parts of concentrated acid.

In a future communication, I will give the process for obtaining the pure perchloric acid in crystals.—*Journal de Pharmacie.*

NEW PROCESS FOR PREPARING OXYGEN.

BY W. H. BALMAIN, ESQ.

A MIXTURE of three parts of bichromate of potash and four parts of common sulphuric acid, contained in a capacious retort, will, on the application of a moderate heat, yield pure oxygen, with a rapidity entirely at the command of the operator.

$$\underset{47.5}{\dot{K}} + \underset{104}{\dddot{Chr}_2} = 151.5 \text{ and } \underset{160}{\dddot{S}_4} + \underset{36}{\dot{H}_4} = 196$$

Produce

$$\underset{475}{\dot{K}} + \underset{40}{\dddot{S}} \text{ and } Chr_2 + \underset{120}{\dddot{S}_3} + O_3 + 24 = 287.5 \text{ and } \underset{36}{\dot{H}_4} \text{ and } \underset{24}{O} + 56$$

This process is cheaper than that of heating chlorate of potash; for two parts of bichromate of potash will produce as much oxygen as one of chlorate of potash, while the latter is nearly three times the price of the former; and besides this, the residue of the first is valuable, and may be reconverted into bichromate of potash. It is likewise a more convenient process than any at present known, since it may be conducted at so low a temperature that an ordinary retort and lamp may be used for the production of a considerable quantity of oxygen.

Liverpool, May, 1842.

(*Note by the Editor of the Philosophical Magazine.* "I have tried this process and find that it answers very well, the gas being given off, I think, with greater readiness than when sulphuric acid and binoxide of manganese are employed. Occasions, I have no doubt, will occur in which this method may be advantageously substituted for others." R. P.)—*London, Edinburgh, and Dublin Philosophical Magazine.*

COMPOSITION OF THE BASIC SULPHATE OF MERCURY, OR TURPETH MINERAL.

BY ROBERT KANE, M.D., &C.

I AM induced to bring forward, in the present form, the results of some analyses of the basic sulphate of mercury, from the fact, that its true composition does not appear to have become generally known; the best authorities, or at least those most in the hands of students, giving different and mostly incorrect views. Thus, both in Christison's Dispensatory and in Pereira's Materia Medica, this salt is stated to have the formula $S\,O^3 + 2\,Hg\,O$, which in the former work is quoted on the authority of Barker and Gergèr, neither of whom was really the author of the analysis, which is a very old one by Braamcamp and Siquiera Oliva, as Dr. Pereira in his excellent work very properly states.

Another much more modern and better analysis, by Dr. Phillips, is quoted in Turner's Chemistry, and also by Dr. Christison; the formula deduced from it is $3\,S\,O_3 + 8\,Hg\,O$. This analysis is very nearly correct, yet the slight error which it contains has the effect of giving to the formula a complexity which it does not properly possess.

In Berzelius's system and in Gay Lussac's *Chimie des Sels*, the formula given is $S\,O_3 + 3\,Hg\,O$. This I have found to be the true composition of the salt, and it is adopted by Graham in his Elements, yet I have never been able to find in the Journals the analyses on which it is founded; hence I consider that the details of those by which I satisfied myself of its correctness may have some interest to Chemists.

A. 6.503 grammes of perfectly dry and neutral sulphate of the red oxide of mercury were boiled for a long time with much water, and the yellow powder which formed was collected on a tared filter, and having been dried until it ceased to lose weight, was found to weigh 4.623 grammes, or 71.09 per cent.

The filtered liquor contained mercury; it was treated with sulphuretted hydrogen, and the sulphuret of mercury which fell was found, when perfectly dry, to weigh 0.76 or 10.85 per cent., corresponding to 10.11 of oxide of mercury.

The excess of sulphuretted hydrogen having been expelled by boiling, the sulphuric acid in the liquor was thrown down by nitrate of barytes. The sulphate of barytes weighed 3.607, or 55.5 per cent., containing 19.08 of sulphuric acid. Of this 3.71 had been united to 10.11 of oxide of mercury, forming 13.82 of sulphate of mercury which had not been decomposed by the water. Hence there had been decomposed 86.18 per cent. of the sulphate, yielding 15.37 of sulphuric acid and 71.09 of turpeth, indicating thus a slight excess of weight, owing probably to the turpeth not having been rendered absolutely dry. Hence 100 parts of the neutral salt, if perfectly decomposed, should give

17.67 of Sulphuric Acid.
82.49 of Turpeth Mineral.

100.16 showing a slight excess, as above noticed.

Now as 100 of neutral salt contains 73.17 of oxide of mercury and 26.83 of sulphuric acid, the quantity of acid left in the liquor is just two-thirds of the whole, as $\frac{2}{3}$ 26.83 = 17.98. The turpeth contained therefore 73.23 of Hg O and 9.16 of S O_3 in the 82.49 parts, or in 100 parts,

Sulphuric Acid = 11.10
Oxide of Mercury = 88.90 } 100.00

The formula S O_3 + 3 Hg O requires

S O_3	= 40.1	= 10.91
3 Hg O	= 328.2	= 89.09
	368.3	100.00

B. 4.525 grammes of turpeth mineral, prepared with boiling water, were dissolved in dilute muriatic acid, and the liquor was precipitated by sulphurretted hydrogen. The sulphuret of mercury weighed 4.334, being 95.76 per cent., equivalent to 89.24 of oxide of mercury. The liquor, boiled to remove the excess of sulphuretted hydrogen, gave then with nitrate of barytes, 1.402 of sulphate of barytes, being 30.98 per cent., containing 10.65 of sulphuric acid. Hence the turpeth mineral consisted in 100 parts, of

89.24 Oxide of Mercury.
10.65 Sulphuric Acid.
.11 Loss.

I need not enumerate more than these two results, although some others were obtained, all of which equally indicated exactly the relation of S O_3 3+Hg O. Of course it will be at once seen that I take for the equivalent number of mercury, on the hydrogen scale, 101.4, and consider the red oxide as containing one equivalent of each element.—*Philosophical Magazine.*

REVIEW.

ANIMAL CHEMISTRY, *or* ORGANIC CHEMISTRY *in its Applications to Physiology and Pathology.* By JUSTUS LIEBIG, M.D., F.R.S., &c. Edited from the Author's Manuscript, by W. Gregory, M.D., F.R.S.E., &c. *Walton and Taylor, London.*

THIS forms the second report on Organic Chemistry presented by Professor Liebig to the British Association. In the former report, of which a notice was given in the early numbers of this Journal, the author confined himself chiefly to the application of chemical science in explaining the phenomena of vegetable physiology; in the present work, a similar application of Organic Chemistry is made to animal physiology and pathology.

The author observes, that

"Before the time of Lavoisier, Scheele, and Priestley, Chemistry was not more closely related to Physics than she is now to Physiology. At the present day Chemistry is so fused, as it were, into Physics, that it would be a difficult matter to draw the line between them distinctly. The connexion between Chemistry and Physiology is the same, and in another half century it will be found impossible to separate them."

Dr. Liebig distinguishes between the *vital force, vis vitæ* or *vitality*, which exists alike in vegetables and animals; and *nervous life*, or consciousness, which is peculiar to the latter class of beings. He says,

"Assimilation, or the process of formation and growth — in other words, the passage of matter from a state of motion to that of rest—goes on in the same way in animals and in vegetables. In both the same cause determines the increase of mass. This constitutes the true vegetative life, which is carried on without consciousness."

But independently of the distinction between animal and vegetable life, arising from the absence of nervous life or consciousness in the latter, a broad line of demarcation may be traced, in the facts, that while vegetables draw their nourishment exclusively from inorganic matter, the food of animals, on the other hand, must, under all circumstances, contain highly organized atoms. There is also another distinction, which is, that vegetable life exhibits itself in the constant extraction and assimilation of carbon from the atmosphere, with the evolution of oxygen; whilst, in animal life, the oxygen of the air is imbibed, and combines with the component parts of the body, and carbonic acid is evolved.

The author observes,

"The efforts of philosophers, constantly renewed, to penetrate the relations of the soul to animal life, have all along retarded the progress of Physiology. In this attempt men left the province of philosophical research for that of fancy; physiologists, carried away by imagination, were far from being acquainted with the laws of purely animal life. None of them had a clear conception of the process of development and nutrition, or of the true cause of death. They professed to explain the most obscure psychological phenomena, and yet they were unable to say what fever is, and in what way quinine acts in curing it.

"For the purpose of investigating the laws of vital motion in the animal body, only one condition, namely, the knowledge of the apparatus which serves for its production, was ascertained; but the substance of the organs, the changes which food undergoes in the living body, its transformation into portions of organs, and its re-conversion into lifeless compounds, the share which the atmosphere takes in the processes of vitality—all these foundations for future conclusions were still wanting."

Dr. Liebig has endeavoured to supply these deficiencies, and to explain the phenomena of animal life in accordance with the laws of chemical combinations and decompositions. It will be readily admitted that this field of investigation was at once a wide, a difficult, and a most important one. The number of the questions which present themselves for solution, and the abstruse and complicated nature of many of these questions, would seem to offer insurmountable obstacles to the complete development of a correct system of physiological chemistry, founded upon the investigations of any one man. The reader of Dr. Liebig's work is therefore no less startled and surprised at the number and the novelty of the theories which are propounded, than at the unity and simplicity which pervade the whole as a system. And even should further researches tend to modify the author's views, and to show that, in some instances, conclusions have been too hastily drawn, upon insufficient data; yet it is evident, on perusing the work before us, that a difficult and complicated subject, has been comprehensively grasped by a philosopher and a man of genius. We are told, that

"All the parts of the animal body are produced from a peculiar fluid, circulating in its organism, by virtue of an influence residing in every cell, in every organ or part of an organ. Physiology teaches that all parts of the body were originally blood; or that, at least, they were brought to the growing organs by means of this fluid.

"The most ordinary experience further shows, that at each moment of life, in the animal organism, a continued change of matter, more or less accelerated, is going on; that a part of the structure is transformed into unorganised matter, loses its condition of life, and must be again renewed. Physiology has sufficiently decisive grounds for the opinion, that every motion, every manifestation of force, is the result of a transformation of the structure or of its substance; that every conception, every mental affection, is followed by changes in the chemical nature of the secreted fluids; that every thought, every sensation, is accompanied by a change in the composition of the substance of the brain."

Thus the living animal is presented to us in the character of an apparatus, in which a succession of chemical changes is constantly taking place, and all the phenomena of life appear as the result of these changes. The oxygen of the atmosphere, by which the animal is surrounded, and which is absorbed into the system with every inspiration, is represented as a principal agent in promoting these changes; and the food which is required for sustaining animal life, contains the fuel supplied for combustion with the inspired oxygen, *as the source of animal heat*, and the materials already formed, and elaborated by the economy of vegetable life, *for supplying the waste, from decomposition, of the tissues and organs of the animal frame.*

"The substances of which the food of man is composed," says the author, "may be divided into two classes; into *nitrogenized* and *non-nitrogenized*. The former are capable of conversion into blood; the latter incapable of this transformation.

"Out of those substances which are adapted to the formation of blood are formed all the organised tissues. The other class of substances, in the normal state of health, serve to support the process of respiration. The former may be called the *plastic elements of nutrition;* the latter, *elements of respiration.*

"Among the former we reckon—vegetable fibrine, vegetable albumen, vegetable caseine, animal flesh, animal blood.

"Among the elements of respiration in our food are—fat, starch, gum, cane sugar, grape sugar, sugar of milk, pectine, bassorine, wine, beer, spirits."

The source of animal heat has long been a subject of discussion among physiologists. By some it has been ascribed to the nerves; by others, to the contractions of the muscles, as in the case of a piece of caoutchouc, which, on being forcibly drawn out, and then allowed suddenly to contract, developes heat. Dr. Liebig, however, justly contends, that these motions could not exist without an expenditure of force consumed in producing them; and that the only known ultimate cause of vital force, either in animals or in plants, is a chemical process.

Thus, he says,

"When we kindle a fire under a steam-engine, and employ the power obtained to produce heat by friction, it is impossible that the heat thus obtained can ever be greater than that which was required to heat the boiler; and if we use the galvanic current to produce heat, the amount of heat obtained is never, in any circumstances, greater than we might have by the combustion of the zinc which has been dissolved in the acid."

And again,

"Let us remember, that the most distinguished authorities in physics consider the phenomena of heat as phenomena of motion, because the very conception of the *creation* of matter, even though imponderable, is absolutely irreconcilable with its production by mechanical causes, such as friction or motion."

The true source of animal heat then, according to the theory of our author, is the combustion of a part of the carbon contained in the food. He says,

"From the accurate determination of the quantity of carbon daily taken into the system in the food, as well as of that proportion of it which passes out of the body in the fæces and urine, unburned, that is, in some form in which it is not combined with oxygen, it appears that an adult, taking moderate exercise, consumes 13.9 oz. of carbon daily.

"These $13\frac{9}{10}$ oz. of carbon escape through the skin and lungs as carbonic acid gas.

"For conversion into carbonic acid gas, $13\frac{9}{10}$ oz. of carbon require 37 oz. of oxygen. * * * *

"Since no part of the oxygen taken into the system is again given off in any other form but that of a compound of carbon or hydrogen; since further, the carbon and hydrogen given off are replaced by carbon and hydrogen supplied in the food, it is clear that the amount of nourishment required by the animal body, must be in a direct ratio to the quantity of oxygen taken into the system." * * * *

"A child, in whom the organs of respiration are naturally very active, requires food oftener than an adult, and bears hunger less easily. A bird deprived of food, dies on the third day; while a serpent, with its sluggish respiration, can live without food three months and longer.

"The number of respirations is smaller in a state of rest than during exercise or work. The quantity of food necessary in both conditions must vary in the same ratio. * * *

"The quantity of oxygen inspired is also affected by the temperature and density of the atmosphere."

It will appear from what has already been stated, that a great part of our food is required for the production of animal heat. But as the heat of the body must be affected by that of the surrounding atmosphere, a greater amount of caloric being carried off by radiation in a cold, than in a warm atmosphere, it follows, that in order to preserve uniformity of temperature in the animal frame, a greater quantity of carbon must be consumed in proportion to the excess of radiation. Thus,

"Clothing is merely an equivalent for a certain amount of food. The more warmly we are clothed the less urgent becomes the appetite for food, because the loss of heat by cooling, and consequently the amount of heat to be supplied by the food is diminished.

"If we were to go naked, like certain savage tribes, or if in hunting or fishing we were exposed to the same degree of cold as the Samoyedes, we should be able with ease to consume ten pounds of flesh, and, perhaps, a dozen of tallow candles into the bargain, daily, as warmly clad travellers have related with astonishment of these people. We should then also be able to take the same quantity of brandy or train oil without bad effects, because the carbon and hydrogen of these substances would only suffice to keep up the equilibrium between the external temperature and that of our bodies.

"According to the preceding expositions, the quantity of food is regulated by the number of respirations, by the temperature of the air, and by the amount of heat given off to the surrounding medium."

The formation of fat in animals is ascribed to the use of an excess of non-nitrogenized food beyond what is required for the

support of respiration; the carbon and hydrogen in this form being laid up in store to supply any future demand from increased exercise or other cause. Thus, starch, gum, sugar, wine, &c. give rise to the formation of fat; and this will be found on reference to the following formulæ, to result, in the case of starch, from the abstraction of oxygen with one atom of carbonic acid.

Starch $C_{12}\ H_{10}\ O_{10}$
Fat .. $C_{11}\ H_{10}\ O$

The fat disappears in the animal body when the supply of oxygen is abundant.

But although the theory of our author assumes that the elements of food, namely, carbon, hydrogen, and nitrogen, unite with the oxygen of the atmosphere to form carbonic acid, water, and urea, it is distinctly stated that these compounds do not directly proceed from the decomposition of the food, without a variety of intermediate changes taking place.

"It would be utterly irrational," he says, "to suppose that the necessity of taking food, or the satisfying the appetite, had no other object than the production of urea, uric acid, carbonic acid, and other excrementitious matters—of substances which the system expels, and consequently applies to no useful purpose in the economy."

The animal organism is constantly undergoing a metamorphosis—some portion is constantly losing its state of vitality, and being expelled from the living parts. The newly formed compounds, the result of this metamorphosis, being soluble, are removed by the circulation of the blood. This fluid in passing through the kidneys and the liver is deprived, in the one case, of those compounds containing the nitrogen of the transformed organs; and in the other case, of those containing the carbon, which are collected in the gall-bladder in the form of bile; and this again passes into the circulation, and its carbon is ultimately carried off as carbonic acid.

In addition to the oxygen absorbed in respiration, Dr. Liebig considers that an important object is effected by means of the *saliva*, in the introduction of atmospheric air directly into the stomach, where its oxygen enters into combination with the food, while the nitrogen is given out through the skin and lungs. He says the saliva possesses the remarkable property of enclosing air in the shape of froth, in a far higher degree than even soap-suds.

An office, somewhat analogous to this is ascribed to the blood globules. We are told that

"The blood contains, in the form of the globules, *the carriers*, as it were, of the oxygen which serves for the production of certain tissues, as well as for the generation of animal heat. The globules of the blood, by means of the property they possess of giving off the oxygen they have taken up in the lungs, without losing their peculiar character, determine generally the change of matter in the body."

This property in the blood is accounted for by the presence of a compound of iron, a knowledge of the characters of which, it is said, may assist us to explain the share which that metal takes in the respiratory process.

"The compounds of protoxide of iron possess the property of depriving other oxidized compounds of oxygen; while the compounds of peroxide of iron, under other circumstances, give up oxygen with the utmost facility.

"Hydrated peroxide of iron, in contact with organic matters destitute of sulphur, is converted into carbonate of the protoxide.

"Carbonate of protoxide of iron, in contact with water and oxygen, is decomposed; all the carbonic acid is given off, and, by absorption of oxygen, it passes into the hydrated peroxide, which may again be converted into a compound of the protoxide.

"All these observations, taken together, lead to the opinion that the globules of arterial blood contain a compound of iron saturated with oxygen, which, in the living blood, loses its oxygen during its passage through the capillaries. The same thing occurs when it is separated from the body, and begins to undergo decomposition (to putrify). The compound, rich in oxygen, passes, therefore, by the loss of oxygen (reduction), into one far less charged with that element. One of the products of oxidation formed in this process is carbonic acid. The compound of iron in the venous blood possesses the property of combining with carbonic acid; and it is obvious, that the globules of the arterial blood, after losing a part of their oxygen, will, if they meet with carbonic acid, combine with that substance. When they reach the lungs, they will again take up the oxygen they have lost; for every volume of oxygen absorbed, a corresponding volume of carbonic acid will be separated—they will return to their former state; that is, they will again acquire the power of giving off oxygen."

In another part, it is stated,

"The frightful effects of sulphuretted hydrogen and of prussic acid, which, when inspired, put a stop to all the phenomena of motion in a few seconds, are explained in a natural manner by the well-known action of these compounds on those of iron, when alkalies are present; and free alkali is never absent in the blood."

The views of the author, with respect to the transformations which take place in the tissues of the animal body, the changes which the food undergoes in its conversion into living organs and secretions, and the influence which certain substances exercise upon the processes of transformation and nutrition, are exceedingly interesting and ingenious, but must be considered, for the most part, as speculations which require a greater amount of evidence for their establishment than has yet been afforded.

The action of some of the nitrogenized vegetable principles, such as quinine, or the alkaloids of opium, &c., is accounted for on the supposition of their taking a share in the formation of new, or the transformation of existing brain and nervous matter.

"However strange," it is said, "the idea may, at first sight appear, that the alkaloids of opium or of cinchona bark, the elements of codeine, morphia, quinine, &c., may be converted into constituents of brain and nervous matter, into organs of vital energy, from which the organic motions of the body derive their origin; that these substances form a constituent of

that matter, by the removal of which the seat of intellectual life, of sensation and of consciousness is annihilated : it is, nevertheless, certain, that all these forms of power and activity are most closely dependent, not only on the existence, but also on a certain quality of the substance of the brain, spinal marrow, and nerves ; insomuch, that all the manifestations of the life or vital energy of these modifications of nervous matter, which are recognised as the phenomena of motion, sensation, or feeling, assume another form as soon as their composition is altered. The animal organism has produced the brain and nerves out of compounds, furnished to it by vegetables: it is the constituents of the food of the animal, which, in consequence of a series of changes, have assumed the properties and the structure, which we find in the brain and nerves."

Having now briefly noticed some of the most important of the subjects, treated of by Dr. Liebig, we must refer the reader to the work itself, in order fully to comprehend and estimate the author's views and theories. The data which are adduced, founded on observation and chemical analysis, will be received with that confidence to which they are entitled, from the known skill and accuracy of the Professsor of Giessen, in such investigations; and the theories founded on these data, while they require to be received with caution, and admitted only where the evidence is quite conclusive, will nevertheless serve to stimulate others to enter this field of enquiry.

A Treatise on the Oleum Jecoris Aselli, *or* Cod Liver Oil. By John Hughes Bennett, M.D. *London, S. Highley, Fleet Street; Edinburgh, Maclachlan and Stewart; Dublin, Fannin and Co.*

This treatise contains a good historical account of the cod-liver oil, its physical and chemical properties, preparation, action on the human economy, mode of administration, and the disorders in which it is recommended. Numerous cases are quoted in confirmation. A paper on this subject, by Mr. Chapman, may be found in this Journal (No. VI., p. 243), which renders it unnecessary for us to enter much into the details. The statements of Mr. Chapman are, in general, corroborated by Dr. Bennett, who informs us that

"The quantity of oil necessary to be taken, in order to obtain a cure, does not appear to follow any certain rule. Schenk cured a rheumatism of two years standing, with six ounces; while, in similar cases, the same result has only been obtained, after twenty or more pounds have been consumed."

The author attributes the efficacy of the oil in a great measure to the small quantity of iodine which it contains, but also considers that the oil itself possesses nutritive and restorative properties, forming an emulsion with the albumen contained in the digestive organs, and also in the blood, and supplying the defi-

ciency of "fatty matter" (or in other words of hydrogen and carbon). This question involves some of the abstruse principles of animal chemistry, and those who are interested in the subject will find much original information in Dr. Liebig's work, which is reviewed in this number.

We pass on to the mode of preparing the cod-liver oil, and the manner in which it is supplied to the English market. The chief obstacle to the employment of this oil as a medicine, is the great variation in the quality, and the extremely disagreeable flavour which characterizes that which we usually meet with. It is not uncommon for a good remedy to fall into disrepute in consequence of an impure or defective sample having been employed; and this we believe to be the case to a certain extent with the one which is now before us.

Cod-liver oil is chiefly imported into this country from Germany, Holland, and other parts of Europe.

The author alludes to four distinct varieties, the white, yellow, red, and brown. This classification is, however arbitrary, as the difference appears to depend upon the degree of care used in preparing it, the heat and pressure employed, and the comparative freedom from impurities. It is not obtained exclusively from the livers of cod, but those of other fish of the same genus are also indiscriminately thrown together, and the oil is expressed in large quantities as an article of commerce. That which flows spontaneously, or with slight pressure, is a light coloured oil, comparatively pure; subsequent portions, obtained by the successive application of increased heat and pressure, are in proportion brown and inferior in quality. "Jobst, of Stuttgard, asserts, that the lighter oil is obtained by boiling the liver, and the brown by boiling also the intestines, which are surrounded with fat."

Dr. Bennett states—

"In London, I found the best cod-liver oil at the house of Messrs. Jones and Co., Leadenhall Buildings, Gracechurch Street, which was very similar in colour, taste, and smell, to the cod-oil I obtained in Mayence. Here also, there was only one kind, which was obtained from Newfoundland. I learnt, however, from Mr. Jones, that different hogsheads in a ship-load of the oil, contained different kinds, as in some it was very light, and in others dark. He mixed them altogether, conceiving that as the oil was only used for manufacturing purposes, it was a matter of no consequence."

In Germany, where the cod-liver oil is much used as a medicine, the Apothecaries select the best samples they can obtain, and are said to have acquired some experience in judging of the quality. We are told, however, that each sample should be analysed before it is brought into use, and that the red or yellow variety is considered the most efficacious. The oil which is imported into this country varies very much in taste, smell, and appearance. We have seen several samples very closely resem-

bling rancid train oil, and others which possessed a rank disagreeable flavour.

The only sample we have met with which was quite free from these objections, had been carefully expressed in London by way of experiment. It was as clear and limpid as oil of almonds, and had the flavour of fresh boiled cod; there was, in short, nothing objectionable in the taste or appearance, and this is a matter of some importance in the case of a remedy which is ordered to be continued for weeks or even months. We are told by Dr. Bennett, that patients become accustomed to the oil and lose the disgust which they feel at taking the first dose. The force of habit will do wonders: in Lapland, train oil is considered a luxury, and cod liver oil is used as an article of food in some countries. In introducing it as a remedy in this country, it is of great importance to obtain it as pure as possible, in which state it is by no means disagreeable. From the facts mentioned by Dr. Bennett and others, and also from our own observation, we doubt whether any dependence can be placed on the purity of the commercial cod liver oil, which is imported into this country, and we therefore recommend our readers to buy the livers and express the oil themselves. Dr. Bennett observes, however, that it will be necessary to submit the English oil to the test of experiment before he will admit that its virtues are identical with those of the article he has been accustomed to use in Germany. This can easily be done in the course of two or three months, when the fish will be in season.

Remarks on Medical Reform, *in a Letter addressed to the Right Honourable* Sir James Graham, Bart. By Sir James Clark, Bart., M.D., F.R.S.

In this pamphlet the author advocates uniformity of education for all medical practitioners, the appointment of a general board of examiners, and such regulations as he conceives likely to promote a good classification of the different ranks or subdivisions which are comprised in the entire profession.

We have no wish to interfere with or discuss these details, as we think the members of each class likely to understand their own affairs best; and as this is one of the privileges which we claim on behalf of our own body, we quote merely Sir James Clarke's remarks on the subject of Pharmacy, which are in accordance with sentiments already expressed in this journal.

"The separation of Pharmacy from medicine is a point strongly insisted on by some, while by others it is considered impracticable in the present state of the profession. Such a separation exists in almost every other country, and ought, and I have no doubt will do so in England at no distant

period. The separation has indeed already commenced; and if the general practitioner is placed in that position in the professional body which he has a right to expect, it will soon be complete.* Negative legislation would probably effect the separation without much disturbance to the present state of things.

"Were the Druggists and Chemists to restrict themselves to what is their proper business, that of preparing and dispensing medicines, the separation of Pharmacy from medicine would be greatly facilitated. Regulations respecting the preliminary education of the Druggists, and their being submitted to a practical examination regarding their knowledge of drugs and pharmaceutical chemistry, before they are permitted to dispense medicines, are absolutely requisite for the safety of the public."

It is impossible by act of parliament to effect this entire separation of Pharmacy from the practice of Medicine, which is recommended by Sir James Clark, and which was also insisted on by Dr. Marshall Hall, in a letter which we published in Vol. I., No. V. It is the duty of the government to enact such laws as shall ensure the proficiency of a sufficient number of practitioners in every branch of the profession, and to sanction such regulations, respecting remuneration, as may be found consistent with justice to all parties; but the public will always in such cases act according to their own judgment or prejudices, and cannot be forced into a compliance with a new system which is at variance with the established custom of past ages. "Negative legislation," therefore, is more applicable, in the present instance, than the positive and direct restrictions on the liberty of the subject which are occasionally advocated.

The adoption of a scale of fees for attendance by general practitioners, and a cessation of the jealousy between this class and the Chemists would, to a great extent, remove the inconvenience which now exists.

The following is Sir James Clark's opinion respecting quackery:

"The suppression of Quackery is a point insisted on by some writers on medical reform. With respect to quack medicines, the government, I think, ought to refuse all patents for such nostrums. If a valuable medicine or remedy is discovered, let it be investigated by some authorized body, or persons; and if found really to deserve this, let the inventor or discoverer be rewarded according to its value. For the suppression of individual quackery, I doubt much the propriety of adopting any direct legislative measures. Deny the rights and privileges of professional men to all but regularly qualified and licensed practitioners, and quackery may be left to its fate."

Before any measures are adopted for the suppression of quackery by law, it will be necessary to discover not only where it is, but where it is not—to point out the precise boundary line between quackery and legitimate practice, and thus to afford a

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* In Edinburgh I understand there are not above *three* or *four* practitioners who supply medicines to their patients—all prescriptions are sent to Druggists.

definite means of carrying out impartially the principles on which the law is based. This would be a difficult task. There is unfortunately in this country a propensity to support quackery; the credulity of the public in such cases is quite unaccountable, and the difficulty of arresting forcibly the progress or continuance of the evil is great in proportion. Two or three prosecutions are a good advertisement for a quack, and notoriety being the great desideratum, silent contempt is the most severe punishment. The only remedy which is likely to be at all effectual is the better information of the public, and a dispassionate exposure of the dangers and impositions which are connected with a system of quackery. It is not sufficient that qualified practitioners in every department should exist:—unless the public are taught to appreciate them, the uneducated and assuming pretenders will always enjoy a certain advantage.

The following remarks of Sir James Clark, on the education of the public, are quoted in confirmation of the opinions we expressed in our last number on the same subject:

"Were the public better informed respecting the causes and progress of diseases, they would know that one-half of the diseases with which mankind are afflicted, might be prevented by common prudence, and that when diseases make their attack they might generally be deprived of half their violence by a knowledge of, and attention to, their premonitory signs and first symptoms. This is the only kind of medical knowledge useful to the public.

"Teach them how they may preserve their health; make them acquainted with the causes of diseases, and the best means of preventing them, and teach them to know the first symptoms of disease, in order that they may apply for medical advice when it is of most avail—and they will possess all the medical knowledge which they can make good use of."

Although it does not come within our province to analyze the other portions of the pamphlet, we may be allowed to express our approbation of the spirit in which it is written, which evinces on the part of the author a disinterested desire to promote the general welfare and improvement of the whole Medical Profession.

THE NEW TARIFF.

In a former number we published a specimen of the proposed alterations in the duty on drugs. Several alterations having been made since that time, we now subjoin a complete list of the old rates of duty with those which are now in force.

SECOND EDITION.

DUTIES OF CUSTOMS,

PAYABLE ON GOODS USED IN PHARMACY,

IMPORTED INTO THE UNITED KINGDOM FROM FOREIGN PARTS.

TARIFF DUTIES OF 1841.		ARTICLES.	PRESENT RATES OF DUTY.	
Of or from Foreign Countries.	Of and from British Possessions.		Of or from Foreign Countries.	Of and from British Possessions.
£ s. d.	£ s. d.		£ s. d.	£ s. d.
0 0 2 lb.	0 1 0 cwt.	Arrow Root . . . the cwt.	0 5 0	0 1 0
0 0 5 "	...	Peel, of Lemons . . do.	0 1 0	0 1 0
0 0 6 "	...	—— of Oranges . . . do.	0 1 0	0 1 0
0 0 8 "	0 0 1 lb.	Tamarinds . . . the lb.	0 0 3	0 0 1
0 15 0 cwt.	0 5 0 cwt.	Honey . . . the cwt.	0 10 0	0 5 0
0 0 0½ gal	...	Juice of Lemons, Limes, & Oranges, the gallon	0 0 0½	0 0 0½
18 18 0 tun	...	Vinegar . . . the tun	18 18 0	18 18 0
3 3 4 cwt.	...	Liquorice Roots . . the cwt.	1 0 0	0 10 0
		——— Paste . . . do.	1 0 0	0 10 0
3 15 0 "	...	——— Juice . . . do.	1 7 6	0 10 0
5 10 0 "	...	——— Powder . . . do.	1 15 0	0 15 0
0 0 2 "	...	Oil Seed Cakes . . the ton	0 1 0	0 1 0
0 8 0 "	...	Lard . . . the cwt.	0 2 0	0 0 6
0 1 0 "	...	Sago . . . . do.	0 1 0	0 1 0
0 1 0 "	...	Tapioca . . . . do.	0 1 0	0 1 0
0 1 0 lb.	0 0 6 lb.	Spices.—Cassia Lignea . the lb.	0 0 3	0 0 1
0 1 0 "	0 0 6 "	Cassia Buds . . . do.	0 0 6	0 0 3
0 1 0 "	0 0 6 "	Cinnamon . . . do.	0 0 6	0 0 3
0 0 6 "	...	Cloves . . . . do.	0 0 6	0 0 6
2 13 0 cwt.	0 11 0 cwt.	Ginger . . . the cwt.	0 10 0	0 5 0
0 0 6 lb.	0 0 1 lb.	——— Preserved . the lb.	0 0 6	0 0 1
0 2 6 "	...	Mace . . . . do.	0 2 6	0 2 6
0 3 6 "	0 2 6 lb.	Nutmegs (from and after the 5th July, 1843). . . do.	0 3 6	0 2 6
0 1 0 "	...	——— Wild, in the shell . do.	0 0 3	0 0 3
0 0 3 "	...	Pimento . . . the cwt.	0 5 0	0 5 0
0 0 6 "	...	Pepper, of all sorts . the lb.	0 0 6	0 0 6
0 5 0 cwt.	...	Seeds.—Anniseed . . the cwt.	0 5 0	0 2 6
3 0 0 "	...	Canary . . . the bushel	0 4 0	0 2 0
1 10 0 "	...	Caraway . . . the cwt.	0 10 0	0 5 0
0 0 9 lb.	...	Carrot . . . . do.	0 10 0	0 5 0
0 15 0 cwt.	...	Coriander . . . do.	0 5 0	0 2 6
0 2 0 "	...	Cummin . . . . do.	0 5 0	0 2 6
0 9 6 "	...	Fennugreek . . . do.	0 5 0	0 2 6
0 1 0 qtr.	...	Linseed . . . the quarter	0 0 1	0 0 1
0 1 0 "	...	Poppy . . . . do.	0 1 0	0 0 6
0 3 0 lb.	...	Quince . . . the cwt.	0 10 0	0 5 0
		Sesamum . . the quarter	0 0 1	0 0 1
		All Seeds not particularly enumerated or described, nor otherwise charged with duty, commonly used for expressing oil therefrom the quarter	0 0 1	0 0 1
0 1 0 qtr.	...			

TARIFF DUTIES OF 1841.		ARTICLES.	PRESENT RATES OF DUTY.	
Of or from Foreign Countries.	Of and from British Possessions.		Of or from Foreign Countries.	Of and from British Possessions
£ s. d.	£ s. d.		£ s. d.	£ s. d.
		All other Seeds not particularly enumerated or described, nor otherwise charged with duty, for every 100*l.* value	10 0 0	5 0 0
30 per cent.	...	Brazil Wood . . the ton	0 2 0	0 2 0
2 0 0 ton	...	Log Wood . . . . do.	0 2 0	0 2 0
0 4 6 "	0 3 0 ton	Saunders, Red . . do.	0 2 0	0 2 0
0 1 0 "	...	——— Yellow . . do.	0 5 0	0 2 6
0 1 0 cwt.	...	Antimony, Ore of . . do.	0 1 0	0 1 0
0 1 0 ton	...	——— Crude . . the cwt.	0 2 0	0 0 6
0 8 0 cwt.	...	——— Regulus . . do.	0 4 0	0 1 0
0 16 0 "	...	Arsenic . . . the cwt.	0 1 0	0 0 6
0 8 0 "	...	Brimstone . . . do.	0 0 6	0 0 3
0 0 6 "	...	——— refined, in rolls . do.	0 2 0	0 1 0
0 6 0 "	...	——— in flour . . do.	0 2 0	0 1 0
0 9 9 "	...	Copperas, Blue . . the ton	1 0 0	0 10 0
0 5 0 "	...	——— Green . . . do.	1 0 0	0 10 0
0 5 0 "	...	———White . . do.	1 0 0	0 10 0
0 12 0 "	...	Gold, leaves of . . the 100	0 3 0	0 3 0
0 3 0 100	...	Iron, Ore of . . the ton	0 2 0	0 0 6
0 5 0 ton	...	—— Chromate of . . do.	0 5 0	0 2 6
0 5 0 "	...	Lapis Calaminaris . . do.	0 1 0	0 1 0
0 1 0 cwt.	...	Lead, Red . . . do.	1 10 0	0 15 0
0 6 0 "	...	—— White . . . do.	2 5 0	1 2 6
0 7 0 "	...	—— Chromate of . . do.	5 0 0	2 10 0
0 2 0 lb.	...	—— Manufactures of, not otherwise enumerated, for every 100*l.* value	15 0 0	15 0 0
0 2 0 cwt.	...	Litharge . . . the ton	1 0 0	0 10 0
0 10 0 ton	...	Manganese Ore . . do.	0 1 0	0 1 0
		Mercury prepared, for every 100*l.* value	10 0 0	10 0 0
30 per cent.	...	Nickel, Ore of . . . do.	1 0 0	1 0 0
5 per cent.	...	———Metallic, and Oxide of, refined do.	10 0 0	10 0 0
20 per cent.	...	Platina, and Ore of . . . do.	0 10 0	0 10 0
1 per cent.	...	Quicksilver . . the lb.	0 0 1	0 0 1
0 0 1 lb	...	Tin, Ore and Regulus of . the ton	2 10 0	0 10 0
0 10 0 cwt.	...	—— Foil . . . the lb.	0 0 6	0 0 6
25 per cent.	...	Aquafortis . . . the cwt.	0 5 0	0 5 0
0 14 3 cwt.	...	Citric Acid . . the lb.	0 0 2	0 0 2
0 0 6 lb.	...	Essences, not otherwise described ...	20 per cent.	
0 4 6 lb.	...	Extract of Cardamoms, for every 100*l.* value	20 0 0	20 0 0
75 per cent.	...	——— Coculus Indicus . do.	20 0 0	20 0 0
do.	...	——— Guinea Grains of Paradise do.	20 0 0	20 0 0
do.	...	——— Liquorice . . do.	20 0 0	20 0 0
do.	...	——— Nux Vomica . . do.	20 0 0	20 0 0
25 per cent.	...	——— Opium . . . do.	20 0 0	20 0 0
do.	...	——— Guinea Pepper . . do.	20 0 0	20 0 0
25 per cent.	...	——— Peruvian or Jesuits' Bark do.	20 0 0	20 0 0
50 per cent.	...	Extract of Quassia, every 100*l.* value	20 0 0	20 0 0
0 5 0 lb.	...	——— Radix Rhataniæ . do.	20 0 0	20 0 0
25 per cent.	...	——— Vitriol . . . do.	20 0 0	20 0 0

TARIFF DUTIES OF 1841.						ARTICLES,	PRESENT RATES OF DUTY.					
Of or from Foreign Countries.			Of and from British Possessions.				Of or from Foreign Countries.			Of and from British Possessions.		
£	s.	d.	£	s.	d.		£	s.	d.	£	s.	d.
20 per cent.			...			Extract or preparation of any article, not being particularly enumerated or described, nor otherwise charged with duty for every 100*l.* value	20	0	0	20	0	0
0	10	0 lb.	...			Or, and in lieu of the above duty, at the option of the importer, the lb.	0	5	0	0	5	0
						Nuts, or kernels thereof, not particularly enumerated or charged with duty, and commonly used for expressing Oil therefrom, the ton	0	1	0	0	0	6
0	0	10 "	...			Oil of Almonds . . the lb.	0	0	2	0	0	2
0	0	3 "	...			— Bays . . . do.	0	0	2	0	0	2
0	2	6 cwt.	...			— Animal, raw, not otherwise enumerated . . . the cwt.	0	1	3	0	1	3
0	1	3 "	...			— Castor . . . . do.	0	1	3	0	1	3
						— Chemical, Essential, or Perfumed, viz.:—						
0	4	0 lb.	...			Caraway . . the lb.	0	2	0	0	2	0
0	14	0 "	...			Cloves . . . . do.	0	4	0	0	4	0
0	4	0 "	...			Lavender . . . . do.	0	2	0	0	2	0
0	4	0 "	...			Mint . . . . do.	0	2	0	0	2	0
0	4	0 "	...			Peppermint . . . do.	0	2	0	0	2	0
0	4	0 "	...			Spike . . . . do.	0	2	0	0	2	0
0	1	4 "	...			Cassia . . . do.	0	1	0	0	1	0
0	1	4 "	...			Bergamot . . . . do.	0	1	0	0	1	0
0	1	4 "	...			Lemon . . . do.	0	1	0	0	1	0
0	1	4 "	...			Otto of Roses . . do.	0	1	0	0	1	0
0	1	4 "	...			Thyme . . . do.	0	1	0	0	1	0
0	1	4 "	...			All other sorts . . do.	0	1	0	0	1	0
0	1	3 cwt.	...			— Cocoa Nut . . the cwt.	0	1	3	0	0	7½
39	18	0 tun	1	0	0 tun	— Linseed . . . . one tun	6	0	0	1	0	0
39	18	0 "	1	0	0 "	— Hempseed and Rapeseed . do.	6	0	0	1	0	0
4	4	0 "	...			— Olive . . . . do.	2	0	0	1	0	0
6	6	0 "	...			— Olive, imported in a ship belonging to any of the subjects of the King of the Two Sicilies . the tun	4	0	0			
0	1	3 cwt.	...			— Palm . . . . the cwt.	0	0	6	0	0	6
8	8	0 tun	...			— Paran . . . . the tun	2	0	0	1	0	0
0	0	10 lb.	...			— Rock . . . . . the cwt.	0	6	0	0	3	0
39	18	0 tun	1	0	0 tun	— Seed, not otherwise enumerated or described . . the tun	6	0	0	1	0	0
0	1	0 "	...			— Train, Blubber, and Spermaceti, the produce of fish, or creatures living in the sea, taken and caught by the crews of British vessels, and imported direct from the fishery, or from any British possession, in a British vessel . . do.	...			0	1	0
26	12	0 tun	...			— Train, and Blubber, the produce of fish, or creatures living in the sea, of Foreign fishing (from and after 5th July, 1843) . . do.	6	0	0			
26	12	0 tun	...			— Spermaceti, of Foreign fishing (from and after do.) . . do.	15	0	0			
0	0	6 lb.	...			— Walnut . . . the cwt.	0	6	0	0	3	0

TARIFF DUTIES OF 1841.		ARTICLES.	PRESENT RATES OF DUTY.	
Of or from Foreign Countries.	Of and from British Possessions.		Of or from Foreign Countries.	Of and from British Possessions.
£ s. d.	£ s. d.		£ s. d.	£ s. d.
		Oil or Spirit of Turpentine the cwt.	0 5 0	0 2 6
		— not particularly enumerated or described, nor otherwise charged		
50 per cent.	...	with duty for every 100*l.* value	20 0 0	10 0 0
0 0 1 lb.	...	Orange Flower Water . the lb.	0 0 1	0 0 1
		Perfumery not otherwise charged,		
20 per cent.	...	do.	20 0 0	20 0 0
30 per cent.	...	Pomatum . . . . do.	20 0 0	20 0 0
		Water, Cologne, the flask (30 con-		
0 1 0 flsk.	...	taining not more than 1 gallon) .	0 1 0	0 1 0
1 10 0 cwt.	...	Alkali, not being Barilla the cwt.	0 1 6	0 1 6
0 2 0 "	...	Alkanet Root . . . do.	0 1 0	0 1 0
0 0 8 lb.	0 0 2 lb.	Aloes . . . the lb.	0 0 2	0 0 1
0 17 6 cwt.	...	Alum . . . . the cwt.	0 2 0	0 2 0
0 11 8 "	...	—— Rock . . . . do.	0 2 0	0 2 0
0 0 6 cwt.	...	Amber, rough . . . do.	0 5 0	0 5 0
		Manufactures of, not enumerated,		
0 12 0 "	...	for every 100*l.* value	15 0 0	15 0 0
0 0 6 oz.	...	Ambergris . . . the oz.	0 0 3	0 0 3
0 4 0 cwt.	...	Angelica . . . the cwt.	0 4 0	0 4 0
0 1 0 "	...	Annatto . . . . do.	0 1 0	0 1 0
0 4 0 "	...	——— Roll . . . . do.	0 1 0	0 1 0
0 0 1 lb.	...	Aristolochia . . . . do.	0 1 0	0 1 0
0 0 6 cwt.	...	Argol . . . . . do.	0 0 6	0 0 6
0 6 0 "	...	Ashes.—Pearl and Pot . . do.	0 0 6	Free
0 1 8 "	...	Soap Weed and Wood . do.	0 0 6	Free
		Not enumerated, for every 100*l.*		
20 per cent.	...	value	5 0 0	Free
0 1 0 ton	...	Asphaltum . . the ton	0 1 0	0 1 0
0 0 1 lb.	...	Balsam, Canada . . the lb.	0 0 1	0 0 1
0 4 0 cwt.	...	Capivi . . . . the cwt.	0 4 0	0 4 0
0 1 0 lb.	...	Peru . . . . the lb.	0 0 3	0 0 3
0 1 0 "	...	Riga . . . . . do.	0 0 1	0 0 1
		And further, as Foreign Spirits,		
1 10 0 gal.	...	for every gallon	1 2 6	1 2 6
0 2 0 lb.	...	Tolu . . . . the lb.	0 0 2	0 0 2
		Balm of Gilead, and all Balsams not		
		otherwise enumerated or described,		
0 4 6 "	...	the lb.	0 0 6	0 0 6
2 0 0 ton	...	Barilla . . . the ton	0 5 0	0 5 0
0 0 1 lb.	...	Bark, Peruvian . . the cwt.	0 1 0	0 1 0
0 0 1 "	...	—— Cascarilla . . . do.	0 1 0	0 1 0
0 0 1 cwt.	...	—— Of other sorts . . do.	0 1 0	0 1 0
0 0 8 "	0 0 1 cwt.	—— For tanners' or dyers' use do.	0 0 3	0 0 1
		Extract of, or other vegetable		
		substances, to be used only for		
0 3 0 "	0 0 1 "	tanning leather . . do.	0 1 0	0 0 1
0 2 0 "	...	Berries, Bay . . the cwt.	0 1 0	0 1 0
0 2 0 "	...	——— Juniper . . do.	0 1 0	0 1 0
0 2 0 "	...	——— Yellow . . .	0 1 0	0 1 0
		Not enumerated, commonly made		
0 2 0 "	...	use of in chemical processes, the ton	0 1 0	0 1 0
0 4 0 cwt.	...	Bitumen Judiacum, see *Asphaltum* do.	0 1 0	0 1 0
0 4 0 "	...	Boracic Acid . . the cwt.	0 0 6	0 0 6
0 10 0 "	...	Borax, refined . . do.	0 5 0	0 5 0
0 0 3 lb.	...	Camomile Flowers . the lb.	0 0 1	0 0 1
0 1 0 cwt.	...	Camphor . . the cwt.	0 1 0	0 1 0

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£ s. d.	£ s. d.		£ s. d.	£ s. d.
2 0 0 cwt.	...	Camphor, Refined . the cwt.	0 10 0	0 10 0
0 0 1 lb.	...	Canella, Alba . . . the lb.	0 0 1	0 0 1
0 1 0 "	...	Cantharides . . . do.	0 0 3	0 0 3
0 1 0 "	...	Cardamoms . . do.	0 0 2	0 0 2
0 1 0 cwt.	...	Caoutchouc . . . the cwt.	0 1 0	0 1 0
0 0 6 oz.	...	Carmine . . . the oz.	0 0 6	0 0 6
0 0 1 lb	...	Cassia Fistula . . the cwt.	0 5 0	0 5 0
0 1 0 "	0 0 6 lb.	—— Buds . . . the lb.	0 0 6	0 0 3
0 0 6 "	...	Castor . . . the cwt.	0 2 0	0 2 0
0 0 3 "	...	China Root . . the lb.	0 0 3	0 0 3
0 0 1 "	...	Cinnabaris Nativa . . the cwt.	0 1 0	0 1 0
0 0 2 "	...	Citrate of Lime . . do.	0 5 0	0 5 0
0 4 9 oz.	...	Civet . . . the oz.	0 2 0	0 2 0
0 1 0 cwt.	...	Cobalt . . the ton	0 5 0	0 5 0
0 2 6 lb.	...	Cocculus Indicus . . the cwt.	0 7 6	0 7 6
0 1 0 cwt.	...	Cochineal and Granilla . do.	0 1 0	0 1 0
0 0 2 lb,	0 0 1 lb.	———— Dust . . do.	0 1 0	0 1 0
0 0 2 "	...	Colocynth . . the lb.	0 0 1	0 0 1
0 0 2 "	...	Columbo Root . . the cwt.	0 1 0	0 1 0
0 2 0 cwt.	...	Cream of Tartar . . do.	0 1 0	0 1 0
0 0 6 lb.	...	Cubebs . . . the lb.	0 0 1	0 0 1
0 2 0 cwt.	...	Drugs not enumerated . the cwt.	0 1 0	0 1 0
0 12 0 "	...	Gelatine . . . do.	0 10 0	0 10 0
0 2 0 "	...	Galls . . . do.	0 1 0	0 1 0
0 4 0 "	...	Gamboge . . . do.	0 1 0	0 1 0
0 4 0 "	...	Gentian . . the ton	0 5 0	0 5 0
0 4 0 "	...	Ginseng . . . do.	0 5 0	0 5 0
0 12 0 "	...	Glue . . . the cwt.	0 3 0	0 3 0
1 per cent.	...	Glue Clippings, or Waste of any kind, fit only for Glue, for every 100*l.* value	1 0 0	1 0 0
0 2 0 lb.	...	Grains, Guinea, and of Paradise, the cwt.	0 15 0	0 15 0
0 6 0 cwt.	...	Gum, viz.:—Senegal . . do.	0 1 0	0 1 0
0 6 0 "	...	Arabic . . . do.	0 1 0	0 1 0
0 6 0 "	...	Copal . . . do.	0 1 0	0 1 0
0 6 0 "	...	Animi . . . do.	0 1 0	0 1 0
0 6 0 "	...	Asafœtida . . . do.	0 1 0	0 1 0
0 6 0 "	...	Ammoniacum . . do.	0 1 0	0 1 0
0 6 0 "	...	Guaiacum . . do.	0 1 0	0 1 0
0 6 0 "	...	Kino . . . do.	0 1 0	0 1 0
0 6 0 "	...	Mastic . . . . do.	0 1 0	0 1 0
0 6 0 "	...	Tragacanth . . do.	0 1 0	0 1 0
0 6 0 "	...	Euphorbium . . do.	0 1 0	0 1 0
0 6 0 "	...	Shellac . . . do.	0 1 0	0 1 0
0 6 0 "	...	Lac Dye . . . do.	0 1 0	0 1 0
		— Seed . . . do.	0 1 0	0 1 0
0 6 0 "	...	Gum, not enumerated . do.	0 1 0	0 1 0
0 0 1 lb.	...	Hellebore . . . do.	0 3 0	0 3 0
2 7 6 cwt.	0 15 0 cwt.	Isinglass . . . do.	2 7 6	0 5 0
0 0 4 lb.	0 0 3 lb.	Indigo . . . do.	0 2 0	0 1 0
0 0 6 "	...	Jalap . . . the lb.	0 0 1	0 0 1
0 1 0 cwt.	...	Lac, viz.:—Sticklac . the cwt.	0 0 1	0 0 1
0 0 10 lb.	...	Lavender Flowers . . the lb.	0 0 1	0 0 1
0 2 0 "	...	Leaves of Roses . . do.	0 0 2	0 0 2
5 per cent.	...	Leeches . for every 100*l.* value	5 0 0	5 0 0
0 0 3 lb.	...	Manna . . . the lb.	0 0 1	0 0 1

TARIFF DUTIES OF 1841.		ARTICLES.	PRESENT RATES OF DUTY.	
Of or from Foreign Countries.	Of and from British Possessions.		Of or from Foreign Countries.	Of and from British Possessions.
£ s. d.	£ s. d.		£ s. d.	£ s. d.
0 0 1 lb	...	Moss, viz.:—Lichen Islandicus, the ton	0 5 0	0 5 0
0 5 0 ton	...	Rock, for dyers' use . do.	0 5 0	0 5 0
5 per cent.	...	Not enumerated, for every 100*l.* value	1 0 0	1 0 0
0 2 0 cwt.	...	Madder . . the cwt.	0 0 6	0 0 6
0 0 6 "	...	——— Root . . . do.	0 0 3	0 0 3
0 16 0 lb.	...	Morphia and its Salts . the lb.	0 5 0	0 5 0
0 0 6 oz.	...	Musk . . the oz.	0 0 6	0 0 6
0 6 0 cwt.	...	Myrrh . . . the cwt.	0 1 0	0 1 0
0 0 6 "	...	Nitre, viz.:—Cubic Nitre . do.	0 0 6	0 0 6
0 2 6 lb.	...	Nux Vomica . . . do.	0 5 0	0 5 0
0 1 0 cwt.	...	Ochre . . . do	0 0 6	0 0 6
0 1 0 lb.	...	Opium . . . the lb	0 1 0	0 1 0
0 6 0 cwt.	...	Olibanum . . the cwt.	0 1 0	0 1 0
0 3 0 "	...	Orchal . . . do	0 1 0	0 1 0
1 8 6 "	...	Orpiment . . . do.	0 1 0	0 1 0
0 10 0 "	...	Orris Root . . do.	0 5 0	0 5 0
		Painters' Colours, not particularly charged, viz.:—		
5 per cent.	...	Unmanufactured, for every 100*l.* value	1 0 0	1 0 0
10 per cent.	...	Manufactured . . do	10 0 0	10 0 0
0 0 4 lb.	...	Pink Root . . the lb.	0 0 1	0 0 1
0 8 0 cwt.	...	Pitch, Burgundy . . the cwt.	0 2 0	0 2 0
8 17 6 "	...	Quassia . . . do.	0 10 0	0 10 0
0 0 6 oz.	...	Quinine, Sulphate of . the oz.	0 0 6	0 0 6
0 0 2 lb.	...	Radix, viz.:—Contrayervæ the lb.	0 0 1	0 0 1
0 13 6 cwt.	...	Enulæ Campagnæ . the cwt.	0 2 0	0 2 0
0 0 6 lb.	...	Eringii . . . do.	0 2 0	0 2 0
0 1 0 "	...	Ipecacuanhæ . . the lb.	0 1 0	0 1 0
0 0 1 "	...	Rhataniæ . . . do.	0 0 1	0 0 1
0 0 2 "	...	Senekæ . . do.	0 0 1	0 0 1
0 0 2 "	...	Serpentariæ or Snake Root . do.	0 0 2	0 0 2
0 1 0 "	...	Rhubarb . . . do.	0 0 3	0 0 3
0 0 10 "	...	Saccharum Saturni . the cwt.	0 10 0	0 10 0
0 1 0 cwt.	...	Safflower . . do.	0 1 0	0 1 0
0 1 0 lb.	...	Saffron . . . the lb.	0 1 0	0 1 0
0 1 0 cwt.	...	Sal, viz.:—Ammoniac . the cwt.	0 1 0	0 1 0
0 4 9 lb.	...	Limonum . . . do.	0 1 0	0 1 0
0 1 0 cwt.	...	Prunella . . . do.	0 1 0	0 1 0
0 1 0 "	...	Salep or Salop . . . do.	0 1 0	0 1 0
0 0 6 "	...	Saltpetre . . . . do.	0 0 6	0 0 6
0 4 0 "	...	Sanguis Draconis . . do.	0 4 0	0 4 0
0 0 6 lb.	...	Sarsaparilla . . the lb.	0 0 1	0 0 1
0 2 0 cwt.	...	Sassafras . . . the cwt.	0 0 6	0 0 6
0 2 6 lb.	...	Scammony . . the lb.	0 0 6	0 0 6
0 0 6 "	...	Senna . . . . do.	0 0 1	0 0 1
0 1 0 ton	...	Schumack . . the ton	0 1 0	0 1 0
0 0 4 lb.	...	Smalts . . . the lb	0 0 2	0 0 2
0 8 0 cwt.	...	Squills, dried . . the cwt.	0 1 0	0 1 0
0 1 0 "	...	——— not dried . . do.	0 0 6	0 0 6
0 0 4 lb.	...	Tartaric Acid . . the lb.	0 0 1	0 0 1
0 1 0 cwt.	...	Terra, viz.:—Japonica . the ton	0 5 0	0 5 0
0 4 0 "	...	Sienna . . . do.	0 10 0	0 10 0
0 4 0 "	...	Umbra . . the cwt.	0 4 0	0 4 0
0 1 0 "	...	Verde . . . the ton	0 5 0	0 5 0

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Of or from Foreign Countries.	Of and from British Possessions.		Of or from Foreign Countries.	Of and from British Possessions.
£ s. d.	£ s. d.		£ s. d.	£ s. d.
0 4 0 cwt.	...	Tincal . . . the ton	0 1 0	0 0 6
0 5 0 "	...	Tornsal . . . the cwt.	0 1 0	0 1 0
0 10 0 "	0 2 4 cwt.	Turmeric . . the ton	0 5 0	0 0 1
0 0 10 lb.	...	Turpentine of Venice, Scio, or Cyprus the lb.	0 0 10	0 0 10
0 1 0 cwt.	...	Valonia . . . the ton	0 5 0	0 5 0
30 per cent.	...	Varnish not otherwise described, for every 100*l.* value	15 0 0	15 0 0
0 0 6 lb.	...	Verdigris . . the lb.	0 0 1	0 0 1
73 12 9 tun	...	Verjuice . . . . the tun	10 0 0	10 0 0
0 0 6 lb.	...	Vermilion . . . the lb.	0 0 3	0 0 3
1 10 0 cwt.	...	Wax, viz.:—Bees' Wax, unbleached the cwt.	0 2 0	0 1 0
3 0 0 "	...	—— in any degree bleached . do.	1 0 0	0 10 0
0 1 0 lb.	...	Myrtle Wax . . . do.	0 2 0	0 1 0
30 per cent.	...	Sealing Wax for every 100*l.* value	15 0 0	15 0 0
0 1 0 cwt.	...	Woad . . . . the ton	0 5 0	0 5 0
0 1 0 "	...	Weld . . . . do.	0 5 0	0 5 0
0 1 0 "	...	Zaffre . . . . the cwt.	0 1 0	0 1 0
0 0 1 "	...	Flax and tow, or codilla of hemp or flax, whether dressed or undressed the cwt.	0 0 1	0 0 1
0 2 6 "	...	Barbadoes Tar . . do.	0 2 6	0 2 6
0 8 0 "	...	Cork (from and after July 5th, 1843) the ton	0 1 0	0 1 0
0 7 0 lb.	...	Corks ready made (ditto) . the lb.	0 0 8	0 0 8
1 0 0 cwt.	...	—— squared for rounding . the cwt.	0 16 0	0 16 0
0 1 6 lb.	...	Lamp Black . . . do.	1 0 0	1 0 0
0 0 6 lb.	0 0 1 lb.	Mustard Flour . . do.	0 12 0	0 12 0
9 10 0 cwt.	...	Spermaceti, fine, for every 100*l.* value	25 0 0	25 0 0
0 4 0 "	...	Sponge . . . the lb.	0 0 6	0 0 1
		Starch . . . the cwt.	0 10 0	0 5 0
		——— Gum of, torrified or calcined, commonly called British Gum . . . do.	0 15 0	0 15 0
		Stavesacre . . . do	0 4 0	0 4 0

TO CORRESPONDENTS.

Mr. Coleman is informed, that the Third Edition of Professor Faraday's work on Chemical Manipulation is in course of publication, by Mr. Murray, Albemarle Street.

"A Member on a Trip" is informed, that the work to which he alludes is not ready for the press. The author has promised to give us due notice of its publication.

"An Associate" (Leamington).—There is no work published for the purpose of explaining French medical phrases to Englishmen.

"An Associate" (Taunton).—We recommend Brande's Manual of Chemistry, or Dr. Turner's Elements. They are both voluminous, and embrace the whole subject. There are several small works, but they are of necessity incomplete; and having been published a considerable time, do not contain the most recent discoveries in the science.

H. Taylor.—De Vallenger' Solution of Arsenic is prepared at Apothecaries' Hall. The formula is a secret. It is sent out labelled "Solution Solvent Mineral." We are not aware whether this is intended for Latin or English — nor have we been able to obtain any information concerning the use of the medicine.

C. G. suggests that specimens of medicinal plants in season should be exhibited in the fresh state at the house of the Society, for the benefit of Members and Associates, who seldom see these articles except prepared.—As the Museum progresses we hope this will be adopted. The Pupils in the Botanical Class have an opportunity of seeing many of these plants at the Lectures.

T. C.—We believe that rectified spirits of wine is only sold retail, in a state of purity, by Chemists.

B. A.—Sulphate of Soda of commerce is generally contaminated with ammonia, which is liberated on mixing it with a caustic or carbonated fixed alkali. — The smell of ammonia is of course a proof of the impurity of the salt.

F. F. has forgotten the water of crystallization.

"An Associate" (London, July 7) is referred to No. XI., page 610, line 26.

R. N., A.P.S., is referred to No. XII., page 649, line 38.

Another "Associate" (London, June 25) is reminded of the necessity of *Chemical Knowledge* in a brewer.

Another "Associate" is referred to No. XI., page 610, line 55. We have no reason to alter the opinion there expressed.

The Council have decided that Chemists in business on their own account cannot be admitted as Associates.

In consequence of the necessity of completing each number of this Journal several days before the close of the month, in order to give time for dispatching the country parcels, communications, containing enquiries, should be sent on or before the 20th, otherwise we cannot ensure the appearance of the replies in the ensuing number.

Advertisements to be addressed to Mr. Churchill, Princes Street, Soho.

Other Communications to The Editor, 338, Oxford Street.

PHARMACEUTICAL JOURNAL.

VOL. II.—No. III.—SEPTEMBER 1st, 1842.

THE SCHOOL OF PHARMACY.

The existence of a school devoted exclusively to the study of those branches of knowledge which are comprised in the systematic education of the Pharmaceutical Chemist, being a novelty in this country, we proceed to make a few remarks on the course of instruction which is to be adopted, and to point out in what respects it differs from that of the Medical Schools.

The School of Pharmacy opened with a short Course of Lectures on Botany, on account of the facility of obtaining specimens of plants during the summer season, and also as an introduction to the Lectures on Materia Medica, which will commence in October.

The foundation of the education in our school is Chemistry, which science, therefore, claims the early attention of the student. In studying the structural characters and physiology of plants, their growth, nutrition, and decay, as well as in the examination of all the substances employed in medicine, whether of an animal or mineral origin—a knowledge of Chemistry is essential. The preparation of drugs which comprehends all pharmaceutical operations, can neither be successfully practised nor clearly understood, without some acquaintance with the ultimate and proximate elements of bodies, their affinities, and the laws relating to combination and decomposition, which constitute the fundamental principles of Chemistry. This science, therefore, which is one of the most interesting, is the most important pursuit to the student in pharmacy, and is calculated to prepare his mind for the reception of other knowledge which he ought to possess.

The lectures, which will be delivered by Mr. Fownes, will comprise a general outline of Chemistry, with as many of the details as are compatible with the prescribed limits. The chief object which has been kept in view in arranging the course, is practical utility, and the several parts of the subject will be treated with more or less amplitude in proportion to their degree of importance to the Pharmaceutical Chemist.

Synopsis of Mr. Fownes's Lectures on Chemistry.

Introduction.
Specific gravity—Practical determination of densities of Solids, Liquids, and Gases.
Physical properties of Gases—The Atmosphere—Principle and use of the Air-Pump and Barometer.
Heat—Expansion of Bodies—Thermometer—Latent Heat—Vaporization.
Oxygen—Hydrogen—Water.
Nitrogen—Chemical history of the Atmosphere.
Compounds of Nitrogen and Oxygen—Nitric Acid.
Carbon and its Oxides—Sulphur—Manufacture of Oil of Vitriol—Phosphorus.
Chlorine—Hydrochloric Acid.
Iodine—Bromine—Fluorine
Compounds of Hydrogen with Nitrogen, Carbon, and Sulphur—Ammonia—Carburetted Hydrogen—Coal Gas Manufacture—Sulphuretted Hydrogen.
General Remarks on the Metals; their physical and chemical Properties—Nature of Saline Combinations.
Metals of the Alkalies—Potassium and Sodium and their Salts.
Metals of the Earths—Lime—Baryta—Strontia—Magnesia.
The Metals proper.
Sketch of Organic Chemistry.

So large a proportion of our medicinal substances are derived from the vegetable kingdom, that the science of BOTANY naturally precedes Materia Medica in the order of arrangement which is recommended to the student. In London and other large cities, the facilities for prosecuting this study are comparatively small, and the country apprentice, who complains of privations in some other respects, enjoys an opportunity which he should not undervalue, of collecting plants and making himself well acquainted with their characters and classification.

The practical knowledge of the productions of nature which may be thus obtained, is the best foundation a student can possess, and is more likely to lead to eminence in the science, than theoretical study in a large city, where the supply of specimens is of necessity scanty and uncertain. The advantage of early application of this kind is particularly felt when the opportunity of attending lectures occurs, as the theory of the classification is more easily understood by those who are familiar with the plants themselves, and those minutiæ of description which a lecturer is enabled to give during his demonstrations, are likely to make a more permanent impression where the mind is previously prepared for their reception. As the lectures on Botany have been delivered, we merely insert the syllabus in order to complete the notice of the School of Pharmacy.

Synopsis of Dr. Thomson's Lectures on Botany.

Introduction—Definition of Botany—the Nature of a Plant, and the distinction between Plants and Animals. Botany has reference to the external or physical Characters, and the Structure of Plants—their vital actions—and their classification: hence it may be divided into *Structural*—*Physiological* and *Systematic.*

I. STRUCTURAL BOTANY is

A. *Particular*—Comprehending

1. Organs essential to the individual life of the Species.
2. Organs essential for the reproduction of the Species.

B. *General*—Comprehending Elementary Organs common to both the former.

A. 1. ORGANS ESSENTIAL TO INDIVIDUAL VEGETABLE LIFE:

a. Roots—Fibrous—Ramose—Tuberose—Fusiform—Creeping-aerial Roots.

Appendages—Cormus—Tubers—Bulbs.

Underground Stems—Rhizomes—Functions of Roots.

b. Stems—general Nature of divisions: 1. of Exogens—2. of Endogens.

1. Structure of Exogenous Stems—Bark—Wood—Pith—Branching—Growth in diameter and length.
2. Structure of Endogenous Stems in Palms—Liliaceæ—Grasses—Ferns—Branching of Endogens

c. Leaves—1. Unexpanded—Leaf Buds—Vernation.

2. Expanded—Varieties of Form, simple and compound—Position of Leaves upon the Stem—Appendages.

Formation of Leaves—Leafless Plants.

d. Stipules—Bracts—Tendrils—Stings.

A. 2. ORGANS OF REPRODUCTION:

e. Flowers—Their arrangement on the Plant, or Inflorescence.

f. Floral Envelopes—Calyx—Corolla.

g. Generative Organs—Stamen—Pistil—Ovary.

h. Ovule—Fruit, Seed, Embryo.

B. ELEMENTARY ORGANS:

a. Cellular Tissue.

b. Vascular Tissue.

c. Woody Fibre.

d. Epidermis—and its Appendages.

II. PHYSIOLOGICAL BOTANY.

Cohesiveness—Permeability—Endosmose—Ascent of the Sap—Transpiration of Plants—Irritability—Secretion—Assimilation and Growth—Fertilization.

III. SYSTEMATIC BOTANY.

a. Artificial System.

b. Natural System.

Each to be illustrated, as far as possible, by Medicinal Plants.

A prize having been offered by the Council, an examination took place at the close of the course, and eight candidates appeared in the field.

The names, characters, and natural orders of the following

plants, which were presented to each competitor, constituted the *viva voce* examination :—

1. Solanum *nigrum*	Solanaceæ
2. Atropa *belladonna*	
3. Datura *stramonium*	
4. Hyoscyamus *niger*	
5. Daucus *carota*	Umbelliferæ
6. Apium *petroselinum*	
7. Æthusa *cyapium*	
8. Anthriscus *sylvestris*	
9. Mentha *viridis*	Labiatæ
10. Anthemis *nobilis*	Asteraceæ
11. Matricaria *chamomilla*	
12 Chicorium *intybus*	Chicoraceæ
13 Cerasus *lauro-cerasus*	Rosaceæ sub. ord. Amygdaleæ.

The following questions constituted the written examination*.

1. What are the characters which distinguish a *root*, a *rhizome*, a *tuber*, a *cormus*, and a *bulb;* and what parts of plants originate from each of them? 10†

2. Describe the different parts which constitute a perfect flower; the uses of each; the change which the fertilization of the flower effects in each; and the mode by which the ovulum is converted into a seed. 20

3. Name the plant which is described below; mention the natural order to which it belongs, and the time at which it should be collected for medicinal use:—"*Root* perennial. *Stem* herbaceous, somewhat woody—bushy—annual—from three to five feet high—round—reddish below. *Leaves* alternate, but in pairs in the axillæ of the principal leaves—one generally smaller than the other—ovate—and acuminate—three to five inches long—on short foot-stalks—entire on the margin—soft and cooling to

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*REGULATIONS FOR THE COMPETITORS.

1. Every Competitor must answer the foregoing questions in writing; but no books are permitted to be taken into the class-room.

2. The written answers must not be headed, nor signed with the name of the Competitor; but the paper containing them must have a number or a motto affixed to it.

3. Each Competitor must write his name upon a card, and enclose it in a sealed envelope, with the number or the motto of his answers on the outside.

4. One hour and three quarters will be allowed to each Competitor to answer the questions.

5. The envelopes will be opened at the next meeting of the Society, and the name of the gentleman who is entitled to the prize made known, and the prize delivered to him by the Chairman. The name of the next Competitor will also be mentioned.

† The numbers denote the comparative value attached to the answer to each question in proportion to its difficulty.

the touch. *Flowers*—bell-shaped—solitary axillary—dingy-purple—greenish towards the base. *Fruit*, a dark, brownish-black, shining, berry-like capsule, seated on a persistent calyx. *Seeds* numerous, kidney-shaped." 20

The time appointed for the examination was seven o'clock in the morning, at which hour the candidates assembled at Bloomsbury Square, and commenced writing the answers, each in turn being called into an adjoining room to undergo the *viva voce* examination, which lasted a quarter of an hour. At nine o'clock, the answers were handed to Professor Thomson, each being identified by a motto, according to the regulations.

The advantage of a class examination at the close of each course of lectures is obvious, as it not only serves as a stimulus to the pupils, but assists in preparing them for the more severe and important examination which they may at a future time undergo, when candidates for membership. After having been examined by the professor of each class in the school, a student is likely to feel some degree of confidence, by being better enabled to estimate his own strength than he would have been without this previous drilling. Much may be learnt at an examination, and what is learnt on such an occasion is not easily forgotten. For this reason it has been proposed by some professors to substitute a series of examinations for a course of lectures: a modification of this plan is calculated to have a good effect, and we hope to see it adopted at our School of Pharmacy.

In consequence of a misunderstanding, most of Dr. Thomson's pupils, who were not candidates for the prize, absented themselves from the examination, under the impression that their attendance would be out of order. In addition to the benefit to be derived on such occasions, by the manner in which the subjects of the *viva voce* questions and answers are impressed upon the memory, it is desirable that all our students should become familiar with competition of this kind, by which means, we think, the dread of examination, which now appears to exist in the minds of many of our Associates, would in a great measure subside. Any ordeal, the nature of which is not known or not understood, is naturally calculated to excite alarm; but a person who is prepared for it by previous experience, and who has by attention to his studies made himself qualified for his business, which ought to be an object of ambition with every one, need be under no apprehension respecting an examination where he will have the opportunity of gaining that credit which he deserves.

It appears from several communications which we have received, that a remark in the leading article of our last number (page 60) has been misunderstood, and therefore requires explanation. In allusion to the law for the admission of Members, under certain circumstances, without examination, on payment of an entrance-

fee, it is stated that this exception "is not applicable in any instance to Associates."* In other words, *no person can be admitted as an Associate without examination under any circumstances*.. It has been repeatedly stated that all Members, Associates, and Apprentices, who joined the Society prior to July 1st, 1842, are exempted altogether from *compulsory* examination : and it must be understood that, in any arguments which we may bring forward in order to induce our present Associates to waive this "privilege," we are advocating an examination which would be entirely *voluntary* on their part, and which would, therefore, if passed, reflect additional honour and credit on them by demonstrating not only their proficiency, but their determination to acknowledge no standard of professional character but that of real merit.

During the daily performance of our duties as Pharmaceutical Chemists, our qualifications are tested in a variety of ways. We are occasionally applied to by medical men for information on points relating to Pharmacy, with which we are supposed to be practically conversant—we are called upon by patients to answer a variety of questions, either to satisfy curiosity or to afford needful information, and on all these occasions we are liable to the imputation of ignorance, and consequent loss of reputation and business in the event of our being unable to give satisfactory replies. Yet we find that few persons shrink from this ordeal, while the dread of a methodical examination is much more prevalent than it would be if the subject were considered in its true light.

Although our lectures on Materia Medica will include an account of the general properties, effects, and doses of remedies, they will not comprehend therapeutics and the practice of medicine, and therefore differ from the lectures on this subject in the medical schools. They are addressed to those who are engaged in practical pharmacy, and to whom an intimate acquaintance with all the substances in the manipulation of which they are daily engaged, is particularly important. The various qualities of drugs, the localities from whence they are obtained, the comparative value of specimens of the same drug from different localities,—the effect of culture in the case of vegetables—the physical characters, medicinal properties, doses, classification, and mode of preparation of drugs—with an explanation of the officinal formulæ in the Pharmacopœia, will constitute the leading subjects comprised in our course of lectures on Materia Medica. The Museum of the Pharmaceutical Society will afford an opportunity of exhibiting a great variety of specimens, an advantage which is not possessed to the same extent in other establishments where the science of medicine is taught.

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* See also *Notice to Correspondents*, p. 171.

The following is an *outline of Dr. A. T. Thomson's lectures* on MATERIA MEDICA.

The course will be divided into two parts: the first part will treat of the *inorganic*, the second of the *organic* substances most commonly employed as medicinal agents. The first part will be generally treated, as most of the articles comprehended in it being objects of Chemistry, they will be specially noticed in the lectures on that branch of science. The second part will treat of the physical characters, and the natural classification of the substances yielding both the animal and the vegetable productions; the sources whence they are obtained, and the modifications caused in their appearances and medicinal properties by climate, seasons, and culture. The active principle or principles of each drug, will be displayed in its separate state; and the distinction which their separation effects in their chemical characters, in reference to their combination with other substances. The best and simplest modes of separating these principles will be pointed out; and, in demonstrating the influence of solvents, and various agents in extracting the soluble and efficient parts of vegetable bodies, the incompatible substances will be extensively displayed; and the influence of extemporaneous combinations, such as usually constitute the prescriptions of physcians explained.

The chief object of the course is to communicate that knowledge to the student, which will make him familiar, not merely with the appearances of drugs so as to enable him to distinguish the good or genuine from the bad and the adulterated; but will also confer upon him that information which will be of use to him in the daily manipulations of the laboratory; in compounding prescriptions; and in the commercial part of his occupation, in reference to the nature of drugs and their relative value as medicinal agents.

The lectures on PHARMACY will comprise, in a systematic form, a description of the various manipulations of the shop and laboratory, with such instructions as the student will find useful, by facilitating the acquirement of a practical knowledge of his business. This subject is generally treated promiscuously in lectures on Chemistry and Materia Medica, but has not hitherto been taught in this country in a separate course of lectures. The Chemist's apprentice gradually acquires manual dexterity in the dispensing of medicines, and the minor operations of the laboratory, without, in many cases, understanding the principles on which he proceeds; and often loses time, or fails in his results, while he is discovering the rationale of a process which, when properly explained, is perfectly simple and easy. There are, in fact, many operations which, in an experienced hand, appear so simple as to require no explanation, but which, if un-

dertaken without method, and clumsily performed, perplex the student. The object of this course of lectures is, therefore, to furnish general rules for the performance of all the operations in Pharmacy, which will enable the apprentice to proceed on scientific principles, instead of trusting to chance or his own ingenuity for the success of any process which he may undertake.

The following is the *synopsis of Mr. Redwood's Lectures on* PRACTICAL PHARMACY :—

PHARMACY defined. Elementary Constituents of the Materia Medica. Laws of Combination. Caloric. Laboratory and Apparatus. Importance of accuracy in weighing and measuring.

Two classes of Pharmaceutical Operations.

1. Operations for effecting the division and separation of the parts or constituents of a body.

2. Operations for effecting combination and mixture.

Subdivided into

A. Mechanical Operations.

B. Chemical Operations.

1 *A.* PULVERIZATION . . *a.* Contusion } *Roots—Barks*
b. Trituration } *Leaves—Seeds*
c. Grinding } *Gums—Gum-resins*
d. Porphyrization—*Rouge*
e. By Mediation—*Camphor—Phosphorus—Colocynth*
f. By Friction—*Magnesia—Ceruse*

ELUTRIATION . . . *Chalk—Bole*
GRANULATION . . . *Zinc—Tin—Iron—Salt of Tartar*
PULPATION . . . . *Fruits*
EXPRESSION . . . . *Vegetable Juices—Fixed Oils*
DEPURATION . . . . *a.* Decantation
b. Filtration
c. Coagulation

B. VAPORIZATION . . . *a.* Vaporization, proper—*Gases*
b. Evaporation—*Extracts—Dried Plants*
c. Distillation — *Rectification —Etherification—Acids*
d. Sublimation — *Calomel — Sulphur — Camphor—Benzoic Acid—Iodine*

CALCINATION . . . . *Bone Earth — Animal Charcoal —Lime— Magnesia*
PRECIPITATION . . . *Metallic Oxides—Sulphur—White Precipitate*
CRYSTALLIZATION . *Salts—Sulphur—Metals*

2. *A.* INCORPORATION . . . *Pills—Electuaries*
DIFFUSION . . . . *Emulsions*
TRITURATION . . . . *Mercurial Ointment—Blue Pill*
B. SOLUTION . . . . . *a.* Solution, proper — *Salts — Syrups — Mucilages*
b. Percolation } *Tinctures*
c. Maceration }
d. Digestion—*Infusions*
e. Decoction—*Decoctions*
f. Distillation — *Medicinal Waters and Spirits*
g. Cohobation—*Etherial Tinctures*

Saponification . . .	*Plasters—Soaps*
Liquefaction	*Ointments—Plasters*
Oxygenizement . .	*a.* Calcination—*Oxides of Zinc and Mercury*
	b. Deflagration—*Potassio-Tartrate of Antimony—Polychrest Salt*
	c. Cohobation—*Oxalic Acid—Metallic Solutions*
Fusion	*Sulphuret of Iron*

The courses of lectures, of which the above is an outline, have been arranged with a view to suit the convenience and present condition of our Associates and Apprentices. The most important features in each subject in relation to the province of the dispensing Chemist, have been selected, and will be treated as much at length as the limits of the time will allow. The opening of a school for the benefit of a class, who have hitherto had no specific instruction provided for them, is an undertaking which requires much deliberation and perseverance. When the attendance of lectures has become recognised as a regular part of the education of the Druggist, apprentices will look forward to fulfilling what will then be one of the conditions named in their indentures; and members will find it not only necessary, but conducive to their interest, to make arrangements for the liberation of their young men for this purpose at stated periods. When this practice has become general, and its advantage is universally admitted, the number of lectures may be increased, and the course of instruction amplified in proportion. It should be our ambition in establishing a School of Pharmacy, to ensure the most complete and efficient education, and to yield to no existing establishments, either in the quality of our lectures or the eminence of the professors whom we engage. In attaining this end, the efforts of the Council must be seconded by the Members generally, as the success of the school will in a great measure depend on the number and assiduity of the students, and the encouragement given to young men by their employers to enlist as pupils, will tend greatly to swell the ranks. We, therefore, hope that the school will open in October with a good attendance, and that our Members, Associates, and Apprentices will unite in promoting the prosperity of an Institution, which can only thrive by their joint efforts. When the School in London is completely established, and has realized our expectations, it will be time to consider the propriety of forming branch schools in other parts of the country, where the amount of population, and the zeal of our brethren in the cause of improvement, are such as to give scope for the undertaking. We have received communications from several places on this subject, and have no doubt that, when the proper time arrives, the zeal will not be found wanting.

PHARMACEUTICAL MEETING,

AUGUST 8.

WILLIAM ALLEN, F.R.S., PRESIDENT, IN THE CHAIR.

The Chairman expressed the great satisfaction he felt at meeting so many of his brethren assembled for scientific discussion, and said, that the first business which claimed the attention of the meeting that evening was the presentation of the prize awarded at the conclusion of the Botanical Lectures of Dr. Thomson, who would announce the successful candidate.

Dr. A. T. Thomson read the regulations* which had been adopted at the examination, and stated, that the candidate, whose motto was "*spero*," had furnished the best written answers; and the motto of the next in order, was "*contendo et spero*." In the *viva voce* examination, Dr. Thomson said, Mr. Robert Bentley had displayed the greatest practical knowledge of plants, and Mr. Hawthorn was second in order of merit.

The sealed envelopes were then opened, when it was found that that one with the superscription "*spero*," contained the card of Mr. Robert Bentley, 338, Oxford Street; and that with the motto "*contendo et spero*," contained the card of Mr. Hawthorn, at Messrs. Hodgkinson's, 86, Snow Hill. Mr. Bentley was, therefore, entitled to the prize, which was accordingly presented to him by the Chairman. It consisted of Dr. Lindley's "Elements of Botany," and "Natural System," bound in one volume. Dr. Thomson said, he had much pleasure in expressing to the meeting the satisfaction which he had felt during the progress of the course of lectures, not only at the regular attendance of the pupils, but the great attention which they had displayed, and the interest which they all appeared to take in the subject. At the examination he had every reason to be satisfied with the answers of the pupils, as they were such as to prove that his instruction had not been without effect; but the replies of the two candidates, whose names had been mentioned, were particularly creditable.

The reading of the papers then commenced; the first of which was,

ON THE VARIETIES OF HYOSCYAMUS.

BY JONATHAN PEREIRA, M.D., F.R.S. & L.S.

Assistant Physician to the London Hospital.

In the last number of the Pharmaceutical Journal is a communication from Mr. Houlton, on the annual and biennial Hyoscyamus niger, from which I gather that he suspects them

* See page 116.

to be distinct species, as he says "I am not at present able to determine the botanical relation of the annual to the true Hyoscyamus niger."

Having carefully examined both plants, I have no hesitation in declaring them to be one and the same species—an opinion which I have expressed in the 2d edition of my "*Elements of Materia Medica and Therapeutics*," vol. ii, p. 1222. The biennial variety is larger, stronger, and more branched than the annual one. In the *Botanical Magazine*, 2394, is a drawing of the latter, which the editor regards as a variety of Hyoscyamus niger. Both varieties have long been used in medicine and are cultivated at Mitcham; but their relative degree of power has yet to be ascertained.

It is curious to observe the different statements of botanists as to the duration of Henbane. Linnæus, Alston, Bergius, B. I. Andrew Murray, Persoon, Woodville, Lindley, and the editors of the *Beschreibung officineller Pflanzen* declare it to be biennial; whereas, Hudson, Withering, Smith, Hooker, Richard, A. T. Thomson, and the editors of the *Handbuchder medicinisch-pharmaceutischen Botanik* state it to be annual. It is remarkable that, in the two works just quoted (the *Beschreibung* and *Handbuch*), of both of which the late celebrated Professor T. F. L. Nees von Esenbeck was part editor, the duration of this plant is so differently stated.

Loudon, Geiger, and I. L. Wheeler declare, correctly as I believe, that the Hyoscyamus niger is both annual and biennial; and in a letter which I received some months since from Sir W. J. Hooker, he says the *niger* "ought to be marked '*annual* or *biennial*.'"

Hyoscyamus niger differs not only in its duration (annual or biennial), but also in the simple or branched condition of its stem, in the depth to which the leaves are incised, in being more or less hairy, in its flowers being sessile or subsessile, and in its corolla being either more or less strongly marked with violet veins, or even entirely yellow. In consequence of this, some botanists have been led to describe varieties of H. niger as distinct species. Thus the *H. agrestis* of Kitaibel, and the *H. pallidus* of the same botanist are merely varieties of *niger*. I am supported in this statement by the high authority of Sir W. J. Hooker, who tells me that he has, in his Herbarium, native specimens of both *H. agrestis* and *pallidus*, and he has no "hesitation in saying, that they are identical with *H. niger*." Moreover, Brandt and Ratzeburg, in their *Deutschlands phancrogamische Giftgewächse* (p. 60), observe: "From our examination of Kitaibel's original specimens in Willdenow's Herbarium, as well as from our observations of numerous plants of black henbane during their whole development from seeds, we are led to regard

H. agrestis as a variety merely of *H. niger*. The distinguishing characters assigned, by different authors, to the former, are all found in the latter plant. *H. niger* is a true annual. It occurs small and large, as well as with or without a branching stem. Both the radical and lower cauline leaves are invariably stalked; the middle cauline ones are broader or narrower, ovate or oblong, with larger or smaller teeth. The flowers have shorter or longer stalks. The uppermost cauline leaves are always more or less entire. Lastly, on the same plant we find variations in the intensity of the colour of the corolla. So that of the characters distinguishing *H. agrestis*, as given by Schultes, Roth, Mertens, Koch, Bluff, and Fingerhuth, not one is left on which we can found its claim to be regarded as a distinct species—or scarcely even as a variety *β minor*.—*Hyoscyamus pallidus* is distinguished merely by the absence of the violet reticulated veins of the corolla, and, therefore, may be compared to the white flowered varieties of plants, which normally have coloured flowers. It is obvious, therefore, that this cannot be admitted as a specific character."

47, *Finsbury Square*.—*August* 8, 1842.

Dr. A. T. Thomson considered that the difference between the varieties of hyoscyamus did not constitute them distinct species, but resulted chiefly, as in other instances, from the influence of cultivation. He had examined some specimens of the annual hyoscyamus in the Botanical Gardens in the Regent's Park, and although he found a difference in the colour of the flowers, and also in the dentation of the leaves, yet in all material points the plant resembled the biennial. It should, however, be understood, that whether the annual or biennial plant be used, it is equally important to gather it at the period of inflorescence, at which time the medicinal properties are developed in the greatest degree.

Dr. Lankester entirely agreed with the author of the paper, that the hyoscyamus *agrestis*, *pallidus*, and *niger* are merely varieties of the same species, although several German writers had contended that hyoscyamus pallidus was a distinct species. He also thought the distinction between the annual and biennial plants was not sufficient to justify their being ascribed to different species.

Mr. Houlton enquired, whether Dr. Thomson and Dr. Lankester had examined the annual and biennial plants together. He had some of both plants in his garden, and had observed considerable difference between them in the woolleyness, in the clammy feeling of the leaves, and in the odour; and although he had not yet tried the medicinal effect of the annual plants, yet he believed it would be found inferior to the other, as it was very deficient in the above characteristics. In the more

marked botanical characters, he admitted the two plants very nearly agreed.

Mr. Mowbray said, he had been informed that the annual hyoscyamus, which was grown at Mitcham, had been brought from America a few years ago. He had used some of it for making into extract, and the result resembled the other extract in its sensible properties. On scraping off some of the woolley covering from the biennial plant, he found it to contain a considerable quantity of essential oil, to which the peculiar odour of the plant is due; and as the annual plant has much less of this covering, he concluded that the medicinal properties of the former would preponderate, provided the evaporation were conducted in *vacuo*, so as to preserve the aroma. A friend of his, however, who had tried both the extracts, had not been able to discover any material difference in the effect.

PREPARATION OF BI-CHLORIDE OF MERCURY,

BY THE DIRECT METHOD.

Dr. A. T. Thomson brought before the notice of the meeting a method which he had adopted for the manufacture of corrosive sublimate, by direct union of the elements. He had taken out a patent for the process, and a manufactory is now established where it is conducted on a large scale. The process consisted in burning mercury in chlorine gas, a method of effecting their combination which had long been known, although not practically adopted; in fact it had been generally considered that a temperature equal to that at which mercury boils (662°), was necessary to induce the combustion of the metal, and the formation of bi-chloride; but he found that a much lower temperature than that was sufficient for the purpose, on which discovery the practical application of the process was founded. He had fitted up a small apparatus, with the view of exhibiting the whole operation to the meeting. A supply of chlorine was generated in a retort from a mixture of hydrochloric acid and oxide of manganese. This gas was conducted through a tube, having a bulb containing the mercury in the centre of it, and this tube was connected with a large receiver; on heating the mercury by means of a lamp to between three and four hundred degrees Fahr., it ignited and burnt with a pale blue flame, giving off a dense white vapour, which, on passing into the receiver, was condensed in a crystalline form on the sides of the vessel.

The sublimate thus formed, Dr. Thomson said, was perfectly

pure; and from the great simplicity of the process, it was offered at a lower price than that made in the usual way; but a prejudice existed in the market in favour of sublimate in lump, which, notwithstanding its higher price, and the trouble and expense of reducing it to a state of powder for use was more generally employed, while that made by his process, being in minute crystals, scarcely required powdering at all.

A paper was next read

ON A MODE OF ANALYZING SODA-WATER AND OTHER AËRATED WATERS.

BY ANDREW URE, M.D., F.R.S., &c.
Hon. Member of the Pharmaceutical Societies of Great Britain and North Germany.

THERE is perhaps no article extensively sold by the Chemist and Confectioner, which varies so much in quality and composition as soda-water. A great deal of what passes under this name hardly deserves it, since it contains so small a proportion of the alkali, as to possess little or none of its antacid and renal operation.

The examination of such a water for its alkaline and saline constituents offers no difficulty to the analytical chemist. For determining the quantity of soda, I employ an alkalimeter of a peculiar construction, composed of a test nitric acid, having a definite density, adjusted by means of a glass bead, so nicely, that half a degree of difference in the temperature by Fahrenheit's scale, either raises the bead to the top or sinks it to the bottom of the liquid. Nitric acid is diluted with distilled water till the adjusted bead floats in its middle at 60° Fahr. This mode of preparing the normal test liquor is both much more ready and precise than that by one of the ordinary instruments for taking specific gravity. An assortment of such beads made with extreme care, is admirably adapted to the preparation of an assortment of normal test liquids for my rapid system of general analysis.

The test liquor is in each case poured out by a glass apparatus so mounted as to permit of introducing it either in a continuous stream of any tenuity, or in fractions of a drop, at pleasure. I intend to publish a particular description of this, and several other pieces of new apparatus, for facilitating analysis, in my forthcoming work on Chemistry.

It is no mean advantage derived from the employment of dilute nitric acid in alkalimetry, that it allows the neutralized liquid to be examined *directly*, for its sulphuric, hydrochloric, phosphoric and most other saline combinations, which could not without complexity be done, were dilute sulphuric acid used for the alkalimeter, as is the common practice. By means of a normal test liquor, made and applied with such nicety, aided by

rightly tinted litmus paper, it is possible to determine in the course of a few minutes the quantity of potash, soda, or ammonia, without calculation, by inspection of the graduated scale on the glass, to one part in 10,000.

In this way I have found that much of the soda-water now on sale in London contains no more than one grain of carbonate of soda in each bottle, diffused, on an average, through 4000 grain-measures of water, or $\frac{4000}{8750}$ of a pint imperial. One sample which was sent to me from Sheffield for examination, contains from six to seven grains of carbonate of soda. One or two other samples have afforded me a somewhat larger proportion of soda.

The method which I employ to determine the quantity of carbonic acid gas present in the said water is peculiarly simple and sufficiently precise. I fasten in the hole of the head of one of Mohr's cork-borers a bit of stiff iron wire, an inch long, to serve as a handle to turn it by. I now force the borer half through the cork of the soda-water bottle, without loosening its wire fastening, then pass over it a soft flaccid ox bladder, and after expelling all its air, I bind the mouth of the bladder firmly round the neck of the bottle with twine. I next work the borer down through the cork into the bottle, and then draw it back into the cavity of the bladder. In this operation the carbonic acid gas rushes into the bladder with explosive violence, and inflates it more or less. The bottle with the bladder held above it is now plunged into cold water, contained in a suitable vessel, and heated up to the boiling temperature. This must be done somewhat slowly, otherwise the thick glass of the bottle will be apt to crack. Whenever the whole of the carbonic acid gas has been expelled from the water, the neck of the bladder is to be tied tightly round above the cork, and its mouth may then be disengaged from the bottle. The bladder is now to be placed in a jar, and water at 60° F. poured over it, till its surface is level with the lip of the jar, the bladder being kept immersed by means of a slender rod. On opening the mouth of the bladder, the gas is expelled by the water pressure, and the level of the water falls. Water out of a graduated cylinder is poured into the jar till it rises to the brim, the quantity of which is the measure of the gas contained in the soda-water.

I have found that the average volume of gas is 12,000 grain-measures in a bottle containing on an average 4000 grain-measures of water, that is, thrice the volume of the water, or two volumes by condensation with the pump, in addition to the one volume which the water absorbs without pressure. One sample of soda-water afforded 13,500 grain measures of gas.

The Chairman then drew the attention of the meeting to a specimen of

MELILOTUS CÆRULEA,

PRESENTED BY JOSEPH HOULTON, M.D.

Who thus describes the plant:

I send for the museum a specimen of Melilotus Cærulea—the Trifolium odoratum of the old botanists. This elegant plant, which is a hardy annual, was well known to the herbalists in the days of Gerard, but it has for very many years been a scarce plant. It is a native of Germany, but was cultivated in this country as an ornamental and a medicinal plant, and known by the herb women in Cheapside by the name of Garden Balsam. It was esteemed on account of its styptic properties. Cases of bloody urine from violent contusions are said to have been wonderfully relieved by the internal use of its juice. It is said to be cultivated in Switzerland, and used there to give the peculiar flavour to cheese; and that it is employed as tea in Silesia. The whole plant, when dry, is very fragrant, and has been used to keep moths from the drawers in which it is placed; it will retain its odour for some years. From this property, perhaps, it is named in France Le Trefle Musqué. I obtained the seed, from which I raised the plant, from D. Price Esq., Surgeon, at Margate, who first directed my attention to it. I have had no experience of its medicinal properties, but think it deserves a fair trial. It is still used by one house in London, in the preparation of an oily remedy for burns.

87, *Lisson Grove.—August* 8, 1842.

Melilotus Cærulea, or Trifolium Odoratum.

A drawing of

COLCHICUM AUTUMNALE*

Was exhibited, with the following remarks,

BY JOSEPH HOULTON, M.D.:

I beg leave to show to the meeting of the members of the Pharmaceutical Society a drawing of colchicum autumnale. The drawing is a faithful portrait of a specimen that was gathered by my friend and late pupil Frederick Barham, Esq., now of Osnaburg Street, a gentleman well versed in medical botany. He gathered the plant at Fressingfield, in Suffolk, where it grows spontaneously, and in great abundance. The specimen, with several others, came packed in wet moss, and arrived in town in a very fresh state, and the drawing was taken on the same day, May 30, 1831, by E. J. Pasquier, under my direction. The upright leaf was traced upon the paper. I do not know that we have a published figure of the plant at this period of its duration.† The old cormus is seen in a shrivelled state; its coat is carried quite away from it, and is on the outside of the base of the new plant, which part is seen to be protuberant with the new cormus.

87, *Lisson Grove*, 8*th August*, 1842.

Mr. Payne thought it right, before the meeting adjourned, to make an allusion to the School of Pharmacy, which would open again in October. As no Pharmaceutical Meeting would take place next month, he took the present opportunity of expressing a hope that the lectures would be well attended. The meeting had heard Dr. Thomson's favourable report of the attendance at the Botanical Lectures, but he hoped that during the ensuing session the number of pupils would be more than doubled. This, he said, was not too much to expect, when the importance of the subject is considered, and also the number of Associates and Apprentices who reside within reach of the School. He would particularly allude to the lectures on Practical Pharmacy, a subject of great importance to the Pharmaceutical Chemist, and one which he believed had not hitherto been taught in this country in a separate course of lectures. Mr. Payne had pleasure in giving notice that Dr. Lankester would deliver a lecture on Botany, on August 24th.

The Chairman then adjourned the meeting until October 12th.

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* See Plate, page 130, fig. 1. The cormus in fig. 1 is smaller than the average size. Fig 2 represents a cormus also drawn from nature.—Ed.

† [In Brandt and Ratzeburg's *Deutschlands Phancrogamische Giftgewächse* is a beautiful coloured representation of the colchicum in fruit, as large as life, and a small woodcut of the same is given by Dr. Pereira, in his *Elements of Materia Medica*.—Ed.]

Fig. 1.

Fig. 2.

LECTURE

ON THE ELEMENTARY COMPOSITION OF FOODS

CONSIDERED IN REFERENCE TO THEIR NUTRITIVE QUALITIES.

BY JONATHAN PEREIRA, M.D., F.R.S. AND L.S.,

Assistant Physician to the London Hospital, and Examiner in Materia Medica and Pharmacy to the University of London.

The object of the present lecture is to lay before the members of the Pharmaceutical Society some account of the recent investigations of Chemists and Physiologists, concerning the nutritive qualities of the food.

If any apology were required for this proceeding, it is to be found in the extraordinary interest which has been excited in the scientific world by the writings of Liebig on Agricultural and Animal Chemistry.*

Though some of the facts, on which the bold and original views of this distinguished Chemist are founded, have been ascertained by others, it is to him mainly that we are indebted for those grand and general views of the vital processes which have contributed to direct the attention of the whole scientific world to him. Furthermore, he has, by himself and his pupils, contributed a number of new facts, which supply many wanting data, by which generalizations like his could alone be supported.

Admitting, as I most fully do, the genius of this eminent Chemist, struck as I, in common with every one, have been with his remarkable and plausible chemico-physiological views, I much regret the tone of excessive confidence which pervades his works. Many of his asserted facts require verification ere they can be admitted; while many of his conclusions, I confess, I think Physiologists are not at present prepared to assent to. He appears to me, in many instances, to have drawn, somewhat too hastily, inferences, which his data (at present unverified by others) scarcely warrant; and his work, therefore, is apt to mislead those persons who are not conversant with the subject, by inducing them to suppose that many of his statements are generally admitted facts, whereas they are here made for the first time, while his conclusions are often, at the best, merely ingenious and plausible theories, which will require years of inquiry to verify, if indeed they should eventually be admitted.

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* *Chemistry, in its application to Agriculture and Physiology*, by Justus Liebig, M.D., Edited by L. Playfair, Ph. D. 2d Ed. 1842. Also, *Animal Chemistry, or Organic Chemistry, in its application to Physiology and Pathology*, by Justus Liebig, M.D. Edited by W. Gregory, M.D. 1842.

One part of his investigations on animal chemistry relate to food; and these it is the purpose of this lecture to notice. In order to bring before you the subject in its simplest form, I propose to confine myself to a general account of the *elementary constituents* of foods, since it is these that his notions particularly concern. He has shown the high interest which attends an inquiry into the nature of the *elements* of food, and has drawn attention to these rather than to the *organic constituents* (alimentary principles) to which preceding writers had almost exclusively devoted themselves.

The number of elementary substances at present known is fifty-five.

ELEMENTS.

1. Aluminum	15. Columbium	29. Mercury	43. Sodium
2. Antimony	16. Copper	30. Molybdenum	44. Strontium
3. Arsenicum	17. Fluorine	31. Nickel	45. Sulphur
4. Barium	18. Glucinum	32. Nitrogen	46. Tellurium
5. Bismuth	19. Gold	33. Osmium	47. Thorium
6. Boron	20. Hydrogen	34. Oxygen	48. Tin
7. Bromine	21. Iodine	35. Palladium	49. Titanium
8. Cadmium	22. Iridium	36. Phosphorus	50. Tungsten
9. Calcium	23. Iron	37. Platinum	51. Uranium
10. Carbon	24. Lantanium	38. Potassium	52. Vanadium
11. Cerium	25. Lead	39. Rhodium	53. Yttrium
12. Chlorine	26. Lithium	40. Selenium	54. Zinc
13. Chromium	27. Magnesium	41. Silicon	55. Zirconium
14. Cobalt	28. Manganese	42. Silver	

These are the substances of which, as far as we have at present ascertained, the earth and all its living inhabitants are composed. The ultimate constituents of minerals, vegetables, and animals, are to be found in this list. But though every one of these elements has been found in the mineral kingdom, not more than about nineteen have been recognised in organised bodies.

ELEMENTS OF ORGANISED OR LIVING BODIES.

1. Carbon	6. Sulphur	11. Fluorine	16. Iron
2. Hydrogen	7. Silicon	12. Potassium	17. Manganese
3. Oxygen	8. Chlorine	13. Sodium	18. Aluminum
4. Nitrogen	9. Iodine	14. Calcium	19. Copper?
5. Phosphorus	10. Bromine	15. Magnesium	

It can scarcely be doubted that copper* is an accidental constituent, but its existence in some organised bodies having been asserted by several chemists, I have admitted it into the list.

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* Copper has been detected in various plants by Bischoff, Meissner, and Sarzeau (De Candolle, *Physiologie Vegetale*, t. i., p. 389.)

Gold *, and more recently *lead* † and *arsenicum* ‡, have been declared to be constituents of organised bodies; but there is reason, I think, to suspect some error in the observations.

A living body has no power of forming elements, or of converting one elementary substance into another §; and it therefore follows that the elements of which the body of an animal is composed must be the elements of its food.

The essential constituents of the human body are thirteen; and the same, therefore, must be the elements of our food.

ELEMENTS OF THE FOOD OF MAN.

1. Carbon	5. Phosphorus	8. Chlorine	11. Potassium
2. Hydrogen	6. Sulphur	9. Sodium	12. Magnesium
3. Oxygen	7. Iron	10. Calcium	13. Fluorine
4. Nitrogen			

By the union of two, three, four, or more of these elements, there are formed certain substances, which, on account of their use as food, may be denominated *alimentary principles*.

ALIMENTARY PRINCIPLES.

1. Water	5. Pectine	9. Albumen (Vegetable & Animal)	12. Gluten
2. Sugar	6. Acetic Acid	10. Fibrine (Vegetable & Animal)	13. Gelatine
3. Gum	7. Alcohol	11. Caseine (Vegetable & Animal)	14. Chloride of Sodium
4. Starch	8. Oil or Fat		

These alimentary principles by their mixture or union form our ordinary foods, which, by way of distinction, we may denominate *compound aliments*. Thus meat is composed of fibrine, albumen, gelatine, fat, &c.; wheat consists of starch, gluten, sugar, and gum.

I proceed now to examine, individually, the elementary constituents of our food; and, for various reasons, commence with carbon.

1. Carbon. In the pure and crystallized state, carbon constitutes the *diamond*, a substance which Sir D. Brewster ‖ suspects to be of vegetable origin. In its more familiar but impure

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* Several distinguished Chemists have asserted the existence of gold in vegetables (Chaptal, *Elements of Chemistry*, vol. ii., p. 442.)

† According to Devergie (*Journal de Chimie Médicale*, t. iv., II^{e} Série, p. 591. 1838) lead and copper are constituents of the bodies of man and other animals.

‡ Orfila (*Journ. de Chim. Méd.* t. v., II^{e} Sér. p. 632. 1839) asserts, that arsenicum is a constituent of the bones of man and other animals. But Dr. G. O. Rees, Messrs. Danger and Flandrin, and the Commissioners appointed by the French Academy of Sciences, have repeated his experiments without detecting it. [Orfila detected and acknowledged his error, we believe, before it was pointed out to him.—Ed.]

§ Dr. Brown (*Transactions of the Royal Society of Edinburgh*, for 1841) declared that Carbon was convertible into Silicon, but his experiments have not been corroborated by those of others.

‖ *Edinburgh Philosophical Journal*, vol. iii., p. 98; and *Philosophical Magazine*, vol. i., p. 147. 1827.

forms, carbon constitutes *plumbago* (graphite or black-lead) and *charcoal* (animal and vegetable). The last mentioned substance is always contaminated with various earthy bodies derived from the organic matter out of which the charcoal was made.

ANIMAL CHARCOAL.*		VEGETABLE CHARCOAL.†						
			Thorn.	Poplar.	Maple.	Oak.	Aspen.	Spindle.
Carbon	10.0	Carbon	88.0	85.6	85.2	83.2	82.0	82.8
Phosphate of Lime	88.0	Volatile Matter ..	9.6	13.4	13.8	15.0	15.0	15.6
Carbonate of Lime		Calcined Ashes ..	2.4	1.0	1.0	1.8	3.0	1.6
Carburet or Silicet of Iron	2.0							
Sulphuret of Calcium, or Iron ..	traces							
Animal Charcoal or Bone Black	100.0	Vegetable Charcoal	100.0	100.0	100.0	100.0	100.0	100.0

Carbon is an essential constituent of every living or organised tissue, both vegetable and animal. It is, therefore, a necessary ingredient of food; and nature has accordingly supplied it in the aliment which she has provided for all living beings in the early stage of their existence. Thus it is an element of the organic substances composing seeds (albumen and cotyledons), and from which the embryo plant derives its first nutriment. The yolk of the eggs, the food of the embryo chick, and the milk on which young mammals subsist during the first period of their existence after birth, also contain it.

The quantity of carbon contained in different foods varies considerably, though in all it constitutes a very large proportion. In the following table these proportions are stated.

QUANTITY OF CARBON IN FOODS.

1.—*Alimentary Principles.*

a. NON-NITROGENISED:

		Per-centage, by weight, of Carbon.	
Saccharine	Sugar Candy	42.1	
	Sugar of Milk	40.0	Prout and Liebig.
	Grape Sugar (from Honey)	36.36	Prout
Amylaceous	Wheat Starch	37.5	Ditto.
	Ditto, dried at 350° Fahr.	44.0	Ditto.
	Arrow Root	36.4	Ditto.
	Ditto, highly dried at 212° Fahr.	44.4	Ditto.

* Dumas, *Traité de Chimie appliqué aux Arts*, t. i, p. 450.
† Berthier, *Traité des Essais par la voie sèche*, t. i, p. 286.

Mucilaginous	Gum Arabic	36.3	Prout.
	Ditto, dried at 212° Fahr.	41.4	Ditto.
	Ditto, dried at 240° Fahr.	45.1	Mulder.
Vegetable Jelly	Pectine (from Sweet Apples)	45.198	Ditto.
	Ditto (from Sour Apples)	45.853	Ditto.
	Ditto (in Pectinate of Lead)	43.5	Fremy.
Acidulous	Acetic Acid (anhydrous)	47.06	
	Citric Acid (hypothetical or dry)	43.63	
	Ditto (commercial crystals)	34.29	
	Tartaric Acid (anhydrous)	36.36	
Alcoholic	Alcohol	52.18	
Oleaginous	Butter	65.6	Bérard.
	Mutton Fat	78.996	Chevreul.
	Hog's Lard	79.098	Ditto.
	Olive Oil	77.75	Calculated from Saussure.

b. NITROGENISED:

Proteine Compounds	Animal Albumen (from Eggs)	55.000	Scherer.
	——— Fibrine	55.002	Ditto.
	——— Caseine (from fresh Milk)	54.825	Ditto.
	Vegetable Albumen (from Wheat)	55.01	Jones.
	——— Fibrine	54.617	Scherer.
	——— Caseine	54.138	Ditto.
	Gluten (from Wheat)	55.22	Jones.
Gelatinous	Tendons of Calves' feet	50.960	Scherer.
	Isinglass	50.557	Ditto.
	Cartilages of Calves' ribs (chondrine)	50.895	Ditto.

2.—Compound Aliments.

a. VEGETABLE:

Wheat (dried *in vacuo* at 230° Fahr.)	46.1	Boussingault.
Oats (ditto)	50.7	Ditto.
Rye (ditto)	46.2	Ditto.
Potatoes	12.2598	Ditto.
Ditto (dried *in vacuo* at 230° Fahr.)	44.0	Ditto.
Turnips	3.217	Ditto.
Ditto (dried *in vacuo* at 230° Fahr.)	42.9	Ditto.
Jerusalem Artichoke (ditto)	43.3	Ditto.
Pease	35.743	Playfair.
Ditto (dried *in vacuo* at 230° Fahr.)	46.5	Boussingault.
Lentils	37.38	Playfair.
Beans	38.24	Ditto
Fresh Bread	30.15	Liebig.
Black Bread (dried at 212°)	45.41	Bœckmann.

b. ANIMAL:

Fresh Meat (devoid of fat)	13.6	Liebig.
Ditto (with $\frac{1}{7}$th fat and cellular tissue)	21.75	Ditto.
Dry muscular Flesh (Beef)	51.89	Bœckmann.
Roasted Flesh (Roe Deer)	52.60	Ditto.
Ditto (Beef)	52.59	Playfair.
Ditto (Veal)	52.52	Ditto.
Soup of the House of Arrest at Geissen	0.468	Liebig.

*** The analyses of Liebig, Scherer, Jones, Playfair, and Bœckmann, alluded to in this table, are taken from Liebig's *Animal Chemistry* (London, 1842). Those of Boussingault, are taken from his papers in the *Annales de*

Chimie et de Physique (t. lxiii., lxvii., lxix., and lxxi.)—The results of Mulder's analysis of pectine, I have taken from the *Pharmaceutisches Central-Blatt für* 1838 (p. 338); those of Fremy's analysis of the same substance from the *Journal de Pharmacie* (t. xxvi. p. 373). Prout's experiments were published in the *Philosophical Transactions*, for 1827. I have taken the results of Bérard's and Chevreul's analysis from L. Gmelin's *Handbuch der theoretischen Chemie* (vol. ii. p. 439).

An inspection of this table shows that, of all foods, the oils and fats contain the largest proportion of carbon; while the saccharine, gummy, amylaceous, and acidulous substances, contain a smaller proportion of this substance.

The quantity of carbon consumed, in the form of food, by different individuals, is subject to considerable variation. It is well known that some persons are notorious among their friends and acquaintances for being great feeders,—while others are commonly known as small eaters. The difference is still greater when we compare the eating powers of the inhabitants of different countries.* Whether this depends, as some phrenologists assert,

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* Sir John Ross (*Narrative*, p. 448. 1835.) says, that an Esquimaux "perhaps eats twenty pounds of flesh and oil" daily. But the most marvellous account of gormandizing powers is that published by Captain Cochrane (*Narrative of a Pedestrian Journey through Russia and Siberian Tartary*, vol. i. p. 255. 3d. edit. 1825). He says, that the Russian Admiral Saritcheff was told that one of the Yakuti consumed in twenty-four hours "the hind quarter of a large ox, twenty pounds of fat, and a proportionate quantity of melted butter for his drink." The Admiral, to test the truth of the statement, gave him "a thick porridge of rice boiled down with three pounds of butter, weighing together twenty-eight pounds, and although the glutton had already breakfasted, yet did he sit down to it with great eagerness, and consumed the whole without stirring from the spot: and, except that his stomach betrayed more than an ordinary fullness, he showed no sign of inconvenience or injury"!!

[We quote the following passage from Sir John Ross's Narrative, which refers to the theory of animal heat. It is contained in the Surgeon's Report, which Dr. Collier informs us was written by him in the year 1834.—Ed.

"There are three modes by which heat is probably generated within the body:—by the chemical decomposition which takes place in respiration; by the influence of the brain and nervous system, in some degree, perhaps, analogous to its development by galvanic influence; and by the process of digestion and nutrition.

"If it be acknowledged that combustion goes on more rapidly in cold weather, and that this is wisely pre-ordained, the same remark applies to respiration, in which the imaginative poet and the cold philosopher alike recognise the resemblance. The heat generated will partly depend on the rapidity of the union of the impurities of the blood and the consequent liberation of caloric.

"But it will partly depend on the quantity of carbon and hydrogen contained and taken in with the food. On this ground alone I expect the patience of my readers; for it will follow, if this be admitted, that such provisions should be selected for these expeditions as may have been found to contain these elements in the largest possible excess, loosely combined, and in the most favourable state for elimination. We all know that articles of an opposite chemical constitution lower the temperature, such as nitre, acids,

on the unequal development of a particular part of the brain (which they call the *organ of alimentiveness*) I shall not stop to inquire: it being sufficient for the present purpose that the existence of inequalities of appetites among different individuals is generally recognised.

Liebig estimates the amount ef carbon daily consumed at $15\frac{3}{10}$ oz. avoirdupois [$13\frac{9}{10}$ oz. Hessian] exclusive of that consumed in the form of green vegetables, &c. His statement is based on observations made on the average daily consumption of food, by from 27 to 30 soldiers, of the Body Guard of the Grand Duke of Hesse Darmstadt, in barracks, for a month, or by 855 men for one day. I have drawn up the following table from his statements, and converted the Hessian weights into avoirdupois weights.

Kinds of Food.	Avoirdupois weight of Food.			Avoirdupois weight of Carbon.		
	lbs.	oz.	grs.	lbs.	oz.	grs.
Ordinary meat containing $\frac{1}{7}$ of fat and cellular tissue	306	4	186	80	14	210
Fat or Lard	3	13	$304\frac{1}{2}$	3	1	$156\frac{1}{10}$
Lentils	3	10	412	11	10	$131\frac{2}{10}$
Pease	12	12	161			
Beans	15	0	76			
Potatoes	1093	2	357	133	5	$374\frac{2}{10}$
Bread	1923	9	$214\frac{1}{2}$	589	11	$50\frac{1}{2}$
Total for 855 men for one day	3358	5	398	818	11	47
Average for one man for one day	3	14	$370\frac{1}{2}$	0	15	140

In addition to the above the 855 men consumed,

	lbs.	oz.	grs.
Of Green Vegetables (Cabbages, Greens, Turnips, &c.)	189	7	$401\frac{1}{2}$
Of Sourkrout	110	2	325
Of Onions, Leeks, Celery, &c.	26	11	$203\frac{1}{2}$
Total for 855 men for one day	326	6	55
Average for one man for one day	0	6	47

It also appears, from an approximate report of the serjeant-major, that each soldier consumed daily, on an average, out of the barracks, the following quantities of other foods:

Sausages	$3\frac{3}{10}$ oz.	Avoirdupois weight.
Butter	$\frac{3}{4}$ oz. & $33\frac{1}{3}$ grs.	
Beer	$\frac{1}{2}$ pint	
Brandy	$\frac{1}{10}$ pint	

mineral and vegetable, and hence the failure of lime-juice as an anti-scorbutic, unless aided by nutritious food. On reference to the food destined by nature for the support of the Esquimaux, we find it almost exclusively hydro-carbonaceous, oil, blubber, fish, and flesh, the two latter of which cannot be too fat for them. Here we see a strong analogy between the process of nutrition and that of combustion; nearly the same materials, the same play of affinities, the same results, the same change of latent into sensible caloric."]

So that we may fairly assume, that each of these soldiers consumed daily about one pound (avoirdupois) of carbon. Now if we suppose that while under experiment he neither gained nor lost in weight, what, it may be asked, became of the carbon thus taken in the form of food?

I shall assume, with Liebig, that the carbon of the green vegetables, sourkrout, and onions, was equal to that of the fæces and the urine, and shall exclude from our calculation, the carbon of the small quantity of food (sausages, butter, beer, and brandy) taken in the alehouse. We have, therefore, to account for the disposal of 15ozs. 140grs. avoirdupois (=6702½grs. troy) of carbon; nearly the whole of which quantity must have been thrown out of the system by the lungs and the skin in the form of carbonic acid.

Now 6702½grs. troy of carbon require 17,840grs. of oxygen gas to yield 24,542½grs. of carbonic acid; and it is remarkable that Menzies estimated the quantity of oxygen consumed in respiration, by a man in 24 hours, at 17,625grs.

CONSUMPTION OF OXYGEN IN 24 HOURS.

	Cubic Inches.	Grains.
According to Lavoisier and Seguin	46037 or	15661 (French)
" Menzies	51480 or	17625
" Davy	45504 or	15751
" Allen and Pepys .	39600 or	13464

If it be objected that the estimate of Menzies is too high, it may be replied that the amount of food consumed by the Darmstadt soldiers was perhaps above the average. Each of these is calculated to have eaten 35$\frac{23}{100}$ozs. avoirdupois [32ozs. Hessian] of bread, and about 6ozs. avoirdupois of meat (besides the 3ozs. Hessian, of sausage) daily. Now in the dietary of the Stepney Union (which, I am assured, is considered to be a very good dietary for paupers) the Poor Law Commissioners allow only 14ozs. of bread, and rather more than 2½ozs. of meat as the daily supply.

Moreover, the consumption of food, and consequently of carbon, by females, is considerably less than that by the Darmstadt soldiers.

It is tolerably clear, therefore, from these observations, that further experiments are required to determine the amount of oxygen consumed by different individuals under different circumstances, and that it is especially desirable that the quantity and quality of the food, taken by the person submitted to experiment, should be noted.

I shall presently have to show that part of the oxygen which disappears in respiration, is probably employed in oxidizing hydrogen, phosphorus, and sulphur.

By the union of carbon with oxygen, in whatever part of the system this is effected, heat must be evolved. At least, in all other cases, the formation of carbonic acid is attended with the evolution of heat; and we have a right, therefore, to assume, that the same takes place within the body. We are, in fact, acquainted with no conceivable reason why it should be otherwise. Now, according to Despretz,* one pound of pure charcoal evolves, by its combustion in oxygen gas, sufficient heat to raise the temperature of 78lbs of water from 32° Fahr. to 212° Fahr. This, therefore, must be about the amount evolved in the case of the Darmstadt soldiers, independently of the heat produced by the union of oxygen with hydrogen hereafter to be noticed.

It appears to me that we have a sufficient explanation of animal heat in the chemical changes just referred to. But it is scarcely to be expected that experiments can be so nicely and delicately performed as to demonstrate in a precise manner the truth of this opinion; for while, on the one hand, considerable difficulty is experienced in determining the actual quantity of combustible matter oxidated in the system, it is almost impossible, on the other, to estimate, with absolute nicety, the amount of heat actually imparted by a living animal to surrounding bodies. The results of our experiments, therefore, can only furnish, at the most, approximations to the truth.†

Liebig has endeavoured to show, that by the conversion of starch or sugar into fat, oxygen is supplied to the system; and that by the union of this disengaged oxygen with carbon (from the bile, for example) heat is developed. Suppose 1 equivalent of carbonic acid CO_2, and 7 equivalents of oxygen, O_7, to be abstracted from 1 equivalent of starch, $C_{12}\ H_{10}\ O_{10}$, we have, in the residue, the empirical formula for fat, $C_{11}\ H_{10}\ O$.

1 eq. starch . . .	$C_{12}\ H_{10}\ O_{10}$	1 eq. fat . . .	$C_{11}\ H_{10}\ O$
		1 eq. carbonic acid	$C\ O_2$
		7 eq. oxygen . .	O_7
			$C_{12}\ H_{10}\ O_{10}$

The oxygen thus presumed to be separated from the starch, can only be disengaged in the form of either carbonic acid or water, or of both; therefore it must have combined with carbon or hydrogen, or both. Now, Liebig has adduced several reasons for presuming that heat must attend the formation of carbonic acid under these circumstances. "Thus," says this distinguished

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* Graham, *Elements of Chemistry*, p. 250.

† Despretz observes, that in none of his experiments did respiration produce less than $\frac{7}{10}$ths, nor more than $\frac{9}{10}$ths of the whole heat emitted by the animal (*Ann. de Chimie et Physiq.* t. xxvi. p. 361, 1824). See also Dulong's paper in the *Mem. de l'Acad. Royale des Sciences*, t. xviii., p. 327. 1842.

chemist, "in the formation of fat, the vital force possesses a means of counteracting a deficiency in the supply of oxygen, and consequently in that of the heat indispensable for the vital process."

In the natural and healthy condition of the system, the food supplies the necessary carbon for the support of the animal heat, but when food is withheld, the fat of the body is consumed; its carbon being converted into carbonic acid, its hydrogen into water. Experience has satisfactorily shown that the heat of the blood is the same in all climates and in all conditions of atmospheric temperature. Now it follows that more combustible matter is required in cold climates and cold weather, for keeping up this temperature, than in hot climates and warm weather, since a greater amount of heat must be given off to surrounding media in the former than in the latter. Hence the necessity for a more liberal supply of food in cold weather. "He who is well fed," observes Sir John Ross,* "resists cold better than the man who is stinted, while the starvation from cold follows but too soon a starvation in food. This, doubtless, explains in a great measure, the resisting powers of the natives of these frozen climates; their consumption of food, it is familiar, being enormous, and often incredible." Moreover, it is obvious that the foods which, theoretically, appear to be best suited for the inhabitants of these colder climates, are those which contain the largest amount of carbon and hydrogen, viz., the fats and oils, which contain from 76 to 80 per cent of carbon. The celebrated traveller just quoted, further remarks,† "that in every expedition or voyage to a polar region, at least if a winter residence is contemplated, the quantity of food should be increased, be that as inconvenient as it may. It would be very desirable indeed, if the men could acquire the taste for Greenland food, since all experience has shown that the large use of oil and fat meats is the true secret of life in these frozen countries, and that the natives cannot subsist without it, becoming diseased, and dying with a more meagre diet."

The effect of cold in augmenting, and of heat in diminishing the appetite for food, is well known. I will not, however, go the length of Liebig in asserting, that if we were to go naked, as the Indians, or if in hunting or fishing we were exposed to the same degree of cold, as the Samoyedes, we should be able to consume the half of a calf, besides a dozen of candles.‡ For though it

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* *Narrative of a Second Voyage in Search of a North-west Passage*, page 200. London, 1835.

† Ibid, page 201.

‡ *Annalen der Chemie und Pharmacie*, vol. XLI. Liebig, or his translator, seems to have had some misgivings about the "*half of a calf*," since in the

must be admitted that the inhabitant of a frozen region requires more abundant food than he who lives in a more temperate climate, yet I feel that it is an error to ascribe the voracity and gormandizing powers of some of the natives of the colder regions to the influence of cold only. The Hottentots, and the Bojesmans of the Southern Africa, indulge, as is well known, in beastly gluttony, yet this cannot be the effect of the temperature of their climate. While "the inhabitants of the Alpine regions of Southern Europe demand no such extravagance of food, nor are even the people of Lapland and the northern extremity of Norway conspicuous for such eating; as is not less true of the Icelanders."* Much less heat is evolved when there is a deficiency of food. "During the whole of our march," observes Sir John Franklin,† "we experienced, that no quantity of clothing could keep us warm while we fasted, but on those occasions on which we were enabled to go to bed with full stomachs, we passed the night in a warm and comfortable manner." In tropical climates, and even in cooler regions during the summer, a smaller quantity of food suffices to keep up the temperature of the body, and under the same circumstances, substances containing a less proportion of carbon, are better adapted for the preservation of health.

2. Hydrogen. This, like carbon, is an essential constituent of every living tissue; and, therefore, is a necessary ingredient of our food. The albumen and the oil of the egg, the sugar, the butter, and the caseine of the milk, contain it. Considered with respect to the quantity of hydrogen which they contain, alimentary principles may be arranged in three groups: the first containing those substances whose oxygen and hydrogen are in the same relative proportion as in water; the second, including those whose oxygen is to the hydrogen in a less proportion than in water, or which contain an excess of hydrogen; and the third, comprehending those whose oxygen is to the hydrogen, in a proportion greater than is necessary to form water, or which possess an excess of oxygen.

English translation, I find "10*lbs of flesh*" substituted. The appetites of the Yakuti appear nearly equal to those of the Samoyedes. For, according to Captain Cochrane, whose marvellous stories I have before referred to, a good calf, weighing about two hundred pounds, "may serve four or five good Yakuti for a single meal." (*Op. supra cit.* p. 252.) In another place (p. 255) the same traveller states, that he has repeatedly seen a Yakut or Tongouse devour forty pounds of meat a day; and, he adds, "I have seen three of these gluttons consume a rein-deer at one meal."

* Sir J. Ross, Op. supra cit. p. 447.

† *Narrative of a Journey to the Shores of the Polar Sea, in the years* 1819 *to* 1822, page 424. London, 1823.

ALIMENTARY PRINCIPLES.

Group 1. — *Principles whose oxygen and hydrogen are in the same ratio as in water.*	Group 2. — *Principles containing an excess of hydrogen.*	Group 3. — *Principles containing an excess of oxygen.*
Acetic Acid	Oil	Pectine
Starch	Alcohol	Citric Acid
Sugar	Fibrine, Albumen, Caseine (Animal and Vegetable)	Tartaric Acid
Gum	Gluten	
	Gelatine	

Group 1. *Alimentary principles whose oxygen and hydrogen are in the same ratio as in water.* The substances of this group may be regarded as *hydrates of carbon*, since they consist of carbon and water (or its elements). Their composition is as follows :—

HYDRATES OF CARBON.

Acetic Acid.....12 C + 9 Water
Starch .....12 C + 10 Water
Cane Sugar .....12 C + 10 Water + 1 Water
Gum.....12 C + 10 Water + 1 Water
Sugar of Milk.....12 C + 10 Water + 2 Water
Grape Sugar .....12 C + 10 Water + 4 Water

It is obvious that these foods can yield carbon only to be oxidated in the system, since the hydrogen is already in combination with oxygen. This, therefore, is a sufficient explanation of the fact mentioned by Liebig, that graminivorous animals expire a volume of carbonic acid, equal to that of the oxygen inspired; in other words, there is no loss of oxygen, since one volume of carbonic acid gas contains a volume of oxygen.

2 eq. Oxygen =16	1 eq. Carbon =6	=	1 eq. Carbonic Acid =22

In a state of nature, a large proportion of the food of these animals consists of principles (starch, sugar, and gum) whose hydrogen is saturated with oxygen. In no other way can we account for the fact just referred to; for, as Liebig correctly observes, "at the temperature of the body, the affinity of hydrogen for oxygen far surpasses that of carbon for the same element," and, therefore, the return of an equal volume of carbonic acid by expiration, is an evidence that there was a want of hydrogen for the oxygen to combine with.

Group 2. *Alimentary principles, whose oxygen is to the hydrogen in a less proportion than in water, or which contain*

an excess of hydrogen. This group includes both nitrogenised and non-nitrogenised foods. If we suppose the oxygen of these principles to be combined with hydrogen in the ratio to form water, there will remain, for each, an excess of hydrogen; the amount of which, however, varies in different substances. The following table, constructed on this view, shows the excess of hydrogen which each principle contains, the amount of carbon in each being calculated to be the same.

ALIMENTARY PRINCIPLES CONTAINING EXCESS OF HYDROGEN.

Fat	=48 C+	4.25 water+	38.25 H
Alcohol	=48 C+	24 " +	48 H
Proteine	=48 C+	14 " +	22 H+6 N
Albumen	=48 C+	14 " +	22 H+6 N+*S*+*P**
Fibrine	=48 C+	14 " +	22 H+6 N+2 *S*+*P*
Caseine	=48 C+	14 " +	22 H+6 N+*S*
Gelatinous tissues, tendons	=48 C+	18 " +	23 H+7.5 N
Chondrine	=48 C+	20 " +	20 H+6 N

The ultimate changes which these constituents of foods undergo in the system, are the conversion of the carbon into carbonic acid, and the hydrogen into water. "It signifies nothing," says Liebig, "what intermediate forms food may assume, what changes it may undergo in the body, the last change is uniformly the conversion of its carbon into carbonic acid, and of its hydrogen into water. The unassimilated hydrogen of the food, along with the unburned or unoxidised carbon, is expelled in the urine or in the solid excrements."

By the union of hydrogen with oxygen, and the consequent formation of water, a considerable degree of heat is developed. According to Despretz,† 1lb. of hydrogen yields, by combustion with oxygen, sufficient heat to raise the temperature of 236.4lbs. of water from 32° Fahr. to 212° Fahr.; weight for weight, therefore, hydrogen greatly exceeds carbon in its calorific power.

Part of the heat developed in carnivorous animals must arise from the oxidation of hydrogen; for, in the first place, hydrogen (as of the fat) disappears from the system, and there is no other mode by which it can have done so except by union with oxygen, and its consequent conversion into water. In the second place, of the atmospheric oxygen taken into the lungs during inspiration, the whole is not found in the inspired air in union with carbon, nearly every experimenter having detected a loss.‡

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* The letters S and P are not intended to express the absolute number of equivalents of sulphur and phosphorus, but only the relative proportions of these two elements to each other

† Graham, *Elements of Chemistry*, p. 250.

‡ Messrs. Allen and Pepys (*Phil. Trans.* 1809, p. 404.) ascribed the slight loss observed in their researches to some accidental circumstance, and inferred, therefore, that the oxygen which disappears is exactly replaced by an equal volume of carbonic acid.

Group 3. *Alimentary principles, whose oxygen is to the hydrogen in a proportion greater than is necessary to form water.* None of the substances of this group, which includes pectine (vegetable jelly) and some vegetable acids, are nitrogenised. The following table represents the composition of these principles, on the supposition that the hydrogen is combined with oxygen, in the ratio to form water, the calculation being made for the same amount of carbon in each.

ALIMENTARY PRINCIPLES CONTAINING AN EXCESS OF OXYGEN.

Pectine	=12 C	+17 water	+5 O
Citric Acid (dry)	=12 C	+ 5 "	+6 O
Tartaric Acid (dry)	=12 C	+ 6 "	+9 O

3. Oxygen.—Of all undecompounded or elementary substances, none presents, to my mind, so much interest as oxygen—a principle which constitutes not less than three-fourths of the known terraqueous globe*—which is concerned in almost every change that occurs among natural bodies—and which is so mysteriously connected with life, that without its never-ceasing influence all vital phenomena would speedily cease! As the continuance of the flame of a candle or lamp depends on the due supply of oxygen to the fat or the oil, and as, in the voltaic apparatus, an electric current is excited by the oxidizement of a metal, so animal life seems to be inseparably connected with the influence of oxygen on the organism. Interrupt the influence of oxygen and the flame is extinguished, the electric current is stopped, and all vital phenomena cease. In all three processes, matter (oil, zinc, organic substances) is destroyed or consumed by the oxygen. "Man, and every other animal, are exposed at every period of their lives to the unceasing and destructive action of the atmosphere; with every breath he expires a part of his body, every moment of his life he produces carbonic acid, the carbon of which his food must replace."

Oxygen is a necessary ingredient of our food. The relative proportions of oxygen and hydrogen in different foods have been already alluded to. The following table, taken from Liebig, gives the relative proportions of carbon and oxygen in several alimentary principles.

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* The following calculations support the above statement:—Oxygen is a constituent of the *Atmosphere*, of the *Water*, and of the *Mineral Crust* of the globe. It constitutes $\frac{23}{100}$ by weight of the air, $\frac{8}{9}$ of the aqueous vapour, and $\frac{16}{22}$ of the carbonic acid of the atmosphere. Water, which covers $\frac{3}{4}$ of the globe, at an average depth of about three miles, contains $\frac{8}{9}$ ths of its weight of oxygen. Silica, carbonate of lime, and alumina, the three most abundant constituents of the strata of the earth, contain nearly half their weight of oxygen. Mr. De la Beche (*Researches in Theoretical Geology*, p. 8.) calculates that silica alone constitutes 45 per cent. of the mineral crust of the globe, and of this one-half is oxygen.

RELATIVE PROPORTIONS OF CARBON AND OXYGEN IN ALIMENTARY PRINCIPLES.

In fats (on an average) . . .	120	equivalents of carbon	10	eq. of oxygen
In fibrine, albumen, and caseine	120	"	36	"
In starch	120	"	100	"
In cane sugar	120	"	110	"
In gum	120	"	110	"
In sugar of milk	120	"	120	"
In grape sugar	120	"	140	"

As the carbon and hydrogen of the food are ultimately, for the most part, thrown out of the system in combination with oxygen—that is, in the form of carbonic acid and water—it follows that those foods which contain a small proportion of oxygen only, must consume a greater amount of atmospheric oxygen than those which possess a larger quantity of this element. It cannot be doubted, therefore, that the quality of the food must affect the activity of the function of respiration. This is quite in accordance with the results of experience. Mr. Spalding,* a diver, found that he consumed more atmospheric oxygen in his diving-bell, when he had used a diet of animal food, or drank spirituous liquors; and experience, therefore, had taught him that vegetable food, and water for drink, were best adapted for the performance of the duties of his business. Dr. Fyfe† also found that the consumption of oxygen was greatly reduced by the employment of vegetable diet, though he differed from Mr. Spalding in his account of the effect of alcohol on the respiratory function.

The influence exercised by matters taken into the stomach on the process of respiration, is well illustrated in the case of the vegetable salts of potash or soda. If the acetate, citrate, or tartrate of either of these alkalies be swallowed, the salt suffers partial decomposition in its passage through the system. Its base can be detected in the urine; but its acid has disappeared, and is replaced by carbonic acid. To effect this change, a considerable quantity of oxygen must be consumed. In the case of acetate of potash, no less than eight equivalents of oxygen are required to convert the carbon of every atom of acetic acid into carbonic acid.

CONVERSION OF ACETIC ACID INTO CARBONIC ACID AND WATER.

1 eq. Acetic acid	$C_4\ O_3\ H_3$	4 eq. Carbonic acid	$C_4\ O_8$ —
8 eq. Oxygen	— O_8 —	3 eq. Water . . .	— $O_3\ H_3$
Total. . .	$C_4\ O_{11}\ H_3$	Total. . . .	$C_4\ O_{11}\ H_3$

Now these eight equivalents of oxygen must be derived either from the organism or from the atmosphere. But, as Liebig

* See Dr. John Murray's *System of Materia Medica and Pharmacy*, vol. i. p. 509. 5th ed. Edinb., 1823.

† Quoted by Dr. Bostock, in his *Elementary System of Physiology*, vol. ii. p. 90. Lond., 1826.

justly observes, there is no evidence presented by the organism in itself, that any of its constituents have yielded so large a quantity of oxygen; and we have a right, therefore, to infer that it must have been derived from the air; and that these salts, in their passage through the lungs, appropriate to themselves the necessary amount of oxygen. But do they appropriate that which, if they were not present, would be otherwise employed in the organism? Or do they consume an extra quantity of oxygen? We have no precise data on which we can satisfactorily answer this question. Liebig asserts, that they must consume a part of the oxygen, which would otherwise unite with the constituents of the blood; and "the immediate consequence," he observes, "of this must be the formation of arterial blood in less quantity; or, in other words, the process of respiration must be retarded." But it appears to me, that Liebig's conclusion is by no means a necessary one, and that on this, as on several other occasions, he has decided somewhat too hastily, and written much too positively. I have already shown that the amount of oxygen, consumed by respiration, is modified by the quality of the food; and it is by no means improbable, therefore, that the passage of the above-mentioned salts through the lungs, may occasion a temporary augmented consumption of oxygen; but the evidence for or against this notion is yet to be adduced.

4. Nitrogen *or* Azote.—Nitrogen is distinguished from the three preceding substances, by the indifference which it manifests to enter into chemical combination with other bodies. It is an essential constituent of every living tissue. Fat and water are non-nitrogenised components of the animal body, but they are not organised or living substances. It is obvious, therefore, that for the development, growth, nutrition, and renovation of living animal parts, nitrogen is essential; and accordingly we find, that nature has supplied it in the food which she has furnished for the nourishment of the young animal; it being a constituent of the albumen of the yolk of the egg (the food of the embryo chick), and of the caseine of the milk (the aliment of the young mammal).

A large number of vegetable and animal substances used as food contain no nitrogen. The following table shows the per-centage quantity of this element contained in various foods.

QUANTITY OF NITROGEN IN CERTAIN FOODS.

1. *In Alimentary Principles.*

		Per-centage of Nitrogen	
Proteine Compounds.	Animal albumen (of eggs)	15.920	Scherer.
	Vegetable albumen (of wheat)	15.920	Jones.
	Animal fibrine	15.817	Scherer.
	Vegetable fibrine	15.809	Ditto
	Animal caseine	15.724	Ditto
	Vegetable caseine	15.672	Ditto
	Gluten	15.98	Jones.

Gelatinous.	Tendons of calves' feet	18.470	Scherer.
	Isinglass	18.790	Ditto
	Cartilage of calves' ribs (chondrine)	14.908	Ditto

2. Compound Aliments..

Wheat (dried *in vacuo* at 230° F.)	2.3	Boussingault
Rye (ditto)	1.7	ditto
Oats (ditto)	2.2	ditto
Barley (dried at 212°)	2.02	ditto
Rice (ditto)	1.39	ditto
Indian Corn or Maize (ditto)	2.0	ditto
Pease (dried *in vacuo* at 230° F.)	4.2	ditto
Horse beans (dried at 212 ° F.)	5.5	ditto
White haricots (ditto)	4.3	ditto
Lentils (ditto)	4.4	ditto
Potatoes (fresh)	0.37	ditto
Ditto (dried at 212° F.)	1.80	ditto
Ditto kept 10 months	0.28	ditto
Ditto (dried at 212° F.)	1 18	ditto
Jerusalem artichokes (dried *in vacuo* at 230° F.)	1.6	ditto
White garden cabbage	0.28	ditto
Ditto (dried at 212° F.)	3.70	ditto
Carrot (dried at 212° F.)	2.40	ditto
Turnips	0.17	ditto
Ditto (dried at 212° F.)	2.20	ditto
Dried ox blood	15.08	Bœckmann
Dried muscular flesh (beef)	15.05	ditto
Roasted flesh (roe deer)	15.23	ditto
Ditto (beef)	15.214	Playfair
Ditto (veal)	14.70	ditto

Several circumstances have induced recent writers to conclude, that *nitrogenised foods* are alone capable of conversion into blood, and of forming organised tissues; that, in fact, they only are the foods properly so called. Hence Liebig has denominated them the *plastic elements of nutrition*. The *non-nitrogenised foods*, it is said, are incapable of transformation into blood, and are, therefore, unfitted for forming organised or living tissues. They are, nevertheless, essential to health; and Liebig asserts that their function is to support the process of respiration (by yielding carbon and hydrogen, the oxidation of which is attended with the development of heat), and some of them, he states, contribute to the formation of fat. These non-nitrogenised foods he calls *elements of respiration*.

Nitrogenised Foods, or Plastic Elements of Nutrition.	*Non-nitrogenised Foods, or Elements of Respiration.*	
Vegetable fibrine	Fat	Pectine
——— albumen	Starch	Bassorine
——— caseine	Gum	Wine
Animal flesh	Cane sugar	Beer
——— blood	Grape sugar	Spirits
	Sugar of milk	

[*To be concluded in our next.*]

DONATIONS TO THE LIBRARY.

		Presented by
Pharmacopœia Edinburgensis	1792	Mr. May (Stonehouse
Pharmacopea Quirúrgica de Londres	1797	
Campbell's London Pharmacopœia	1809	Mr. J. Ford (Wolverhampton)
Powell's London Pharmacopœia	1809	Mr. Baynes (Hull)
Pharmacopœia Londinensis	1824	Mr. George Benham (Water Street)
The New Dispensatory	1770	Mr. J. Ford (Wolverhampton)
Cooper's Surgical Dictionary	1830	Mr. J. Fison (Wymondham)
Hare's Physiology of the Stomach	1824	
Macilwain on Porrigo	1833	
Cornutius's "Canadensium Plantarum"	1635	Dr. Neligan (Dublin)
Zanichelli "De Ferro"	1719	
On Distillations, black letter, no date		
Allen on the Chalybeate and Purging Waters of England	1699	
Pechliné "De Purgantibus Exercitatio"	1702	
Touvry, "Traité des Medicamens," 2 vols.	1690	
Gebri Regis Arabum Chymia	1682	
American Journal of Pharmacy, 5 Nos.	1841–42	Society of Pharmacy of Philadelphia
Gray's Supplement	1821	Mr. Baynes (Hull)
Duncan's Dispensatory	1806	
Cooper's complete Distiller	1810	
Account of Askern and its Mineral Springs	1842	Edwin Lankester, M.D. F.L.S.
Experimental Examination of the London Pharmacopœia	1811	Richard Phillips, F.R.S.
Medical and Physical Journal, 6 vols.	1799-1801	Mr. E. S. Knight (Bridport)
Chapman on Venereal Diseases	1770	

The list of Donations to the Museum is so long that we have no room to publish it this month.

ON A VERY SIMPLE AND CORRECT

METHOD OF SEPARATING AND DETERMINING THE QUANTITIES OF POTASH AND SODA

WHEN PRESENT ALONE, OR ACCOMPANIED WITH MAGNESIA, IN A SOIL OR OTHER MIXTURE.

BY MR. WILLIAM HORATIO POTTER, M.R.A.S.

Now that it is almost universally acknowledged, both by the chemist and the agriculturist, that the alkalies *Potass* and *Soda* exercise a very important function in every *fertile* soil, anything tending to simplify the method of separating them when occuring together, and the ascertainment of their relative proportions, cannot fail to be esteemed by those who are interested in either science, as a matter of considerable moment. Hitherto it has

been reckoned, and that justly, to be one of the most difficult problems that chemistry proposes for our solution, to discriminate in a simple and correct manner between the two fixed alkalies Potass and Soda, and to effect their accurate separation.

The difficulty and complexity of the case, is very much enhanced if *magnesia* is also present, as is very frequently the case, and much time is necessary to arrive at a correct result.

Since it has become a matter of prime importance in the analysis of soils to estimate the quantity of the alkalies they contain, I was led to consider whether a concise yet exact method might not be devised for accomplishing this object, and I am now prepared to place before your Society my new plan, and to detail some of the experimental results which confirm its exactness and general applicability. Its simplicity will be best demonstrated by contrasting it with the directions given by that most excellent chemist Berzelius, than whom no analyst deserves more of our praise or confidence, or has done more towards bringing analytical chemistry to that high standard of perfection to which it has now attained.

After setting before chemists the two processes, and assuring them that the second does not yield in accuracy to the first, I shall leave it for them to choose which they will in future employ.

Berzelius's words are these, which I translate from the French of M. Esslingen.

"If it should happen that both alkalies be present, it is *very* (assez) *difficult* to separate them, so as to determine their exact proportions. Of several modes I have tried, the following has succeeded the best: we mix the salt obtained (chloride or chlorides) with three and three-quarter times its weight of crystallized chloride of platinum and sodium, this being the precise quantity necessary for the potassium to replace the sodium contained in the double salt, on the supposition that the salt we are examining is nothing but chloride of potassium.

"We dissolve the mixture in a very little water, and evaporate to dryness, by a gentle heat, then we treat it with alcohol, which dissolves the chloride of sodium, and the chloride of platina and sodium, but it does not dissolve the chloride of platina and potassium, which is to be washed with alcohol, and then dried and weighed: 100 parts of this salt contain 30.86 of chloride of potassium.

"The deficiency of the original weight is chloride of sodium. The quantity of pure alkali corresponding to these chlorides is calculated from the tables.

"*Remark.*—It is not equally advantageous to use the simple chloride of platina, because an excess of this salt must be employed, which is easily decomposed by alcohol, in which, however, the chloride of platina and sodium is soluble without decomposition."

Again, when magnesia is likewise present, he says:

"When a mineral contains magnesia, we always obtain this earth as a sulphate of magnesia, combined with sulphate of alkali. Its presence is discovered by pouring into the concentrated solution of the salt a large

excess of strong caustic ammonia, which precipitates part of the magnesia. In this case, we evaporate to dryness, in order to volatilize the ammonia, and we treat the residual salt (as we have just said) with acetate of barytes. If, after the combustion of the acetic acid, the residue is treated with water, this liquid dissolves the alkali and leaves the magnesia mixed with carbonate of barytes. This earth may be separated by means of sulphuric acid."

The latter quotation refers solely to the mode of separating the magnesia; if the portion dissolved by the water should contain *both* alkalies, the operose process described in the first, will have to be performed.

My method is founded upon the property of a *saturated* solution (at a given temperature) of sulphate of potass being capable of dissolving sulphate of soda, while it is of course totally incapable (the temperature being the same) of dissolving any more of the sulphate of potass. This appears pretty evident, but it was necessary to prove, by actual experiment, whether the presence of a soda salt might not influence this insolubility, either by the formation of a double salt or from some other cause. I accordingly prepared some pure sulphate of potass by saturating, exactly, crystallized bicarbonate of potass with pure sulphuric acid, evaporating and igniting in a platina crucible. I prepared also some pure sulphate of soda, in a similar manner, from pure carbonate of soda.

I then mixed a known weight (nearly equal) of the two salts, by rubbing them to fine powder, and submitted the mixture for about an hour (taking care to keep the temperature uniform) to the action of a sufficient quantity of a saturated solution of sulphate of potass which refused to dissolve the minutest portion of sulphate of potass, when added in the finest powder. It was then filtered through two counterpoised filters, and washed with a little of the saturated solution. The filters were then put between folds of bibulous paper, and pressed with a weight, and dried thoroughly by a heat just insufficient to char the paper, until there was no further loss of weight. The weight of the sulphate of potass collected on the inner filter (obtained by the difference of weight of the two filters), corresponded exactly with that known to exist in the mixture. The weight of the sulphate of potass thus obtained, deducted from the weight of the mixed salts, gave of course that of the sulphate of soda.* I have been thus particular in mentioning the *manipulation*, in order that the process may succeed equally in other hands than my own. Having attained such an exact result in a simple mixture of sulphates of alkalies, I was anxious to know whether my plan was equally applicable, in combination with the ammoniacal phosphate of soda, to the

* The quantities of the *pure* alkalies are to be obtained by calculations from the *known* composition of their sulphate.

separation of magnesia; and here I had occasion to notice the interference of the formation of a double salt in vitiating the result. My first trial was directed to the dissolving out of the mixture of sulphates, the sulphates of magnesia and soda; by the saturated solution of sulphate of potass, expecting that the sulphate of potass would be left intact, as in the former case; but I found that it did not weigh much more than half the proper quantity. This I repeated more than once with a similar result.

I proceeded, however, to precipitate the magnesia by the double phosphate, which gave the quantity correctly. I then altered my plan, by dissolving the mixed salt in a small quantity of *water*, and then added a sufficient quantity of double phosphate to precipitate the whole of the magnesia; I assisted the separation by a gentle heat, received the precipitate on a double filter, washed with a *little* water, and dried on filter, at about 100° Fahr. By calculating the ammonio-phosphate of magnesia thus procured, to contain nineteen per cent. of magnesia (which was proved by a comparative experiment made exactly in the same way with Epsom salts alone), it gave me the original quantity in the mixture. I also submitted the ammonio-phosphate of magnesia to a red heat, and calculated the magnesia from the remaining magnesian-phosphate (allowing thirty-nine per cent. magnesia), with the same result. It now remained to separate the two alkalies, which was done by procuring their sulphates, by evaporating the filtered liquor and washings, and proceeding as in the first case.

It should not be concealed that there was a little deficiency here in the obtained weight of the sulphate of potass, and consequently a corresponding inferred weight in the sulphate of soda, arising undoubtedly from the impossibility of copiously washing the ammonio-magnesian phosphate, on account of its partial solubility.

I have proved, by my own experience, the simplicity and speediness of the operation, by separating and weighing the three substances in little more than two hours.

PREPARATION OF DECOCTUM ALOES COMPOSITUM.

Mr. Maddock, of Tunbridge Wells, in a communication on this subject, alludes to the great difference which exists in this preparation, as obtained from different houses; and ascribes this difference to the length of time during which it has been kept—the aloes and myrrh being gradually deposited, until at last the decoction is left nearly destitute of these ingredients.

He says, "The plan I adopt is to follow the Pharmacopœia

implicitly, as to articles and quantities ordered; but instead of boiling the saffron with the other ingredients, I first make an infusion of it in a small quantity of boiling water, which infusion is added to the tincture, and the almost spent saffron added to the other articles, to be boiled the proper time, completing the process by an accurate attention to the quantity of the required product. By this means much of the flavour of the saffron is preserved, which, by boiling, is dissipated to a great degree; but the question is, What is next to be done? I would beg to suggest, that the decoction should be allowed to stand twenty-four hours to cool and deposit, after which it should be filtered through paper; and subsequently, whenever used, that the deposit that will still continue to form, should be as much as possible combined with the decoction by agitation, so that something of an uniform preparation may be kept by all."

We agree with Mr. Maddock that this preparation is subject to considerable variation, resulting not only from the degree of care which is bestowed in making it, but also from changes which necessarily take place, and which occur when no deviation has been made from the instructions of the Pharmacopœia. It is very desirable, therefore, that some means should be devised whereby the uniformity in appearance and operation of this valuable medicine may be ensured.

The principal cause of the deposition of so much of the aloes, when the decoction has been kept for some time, may be traced, we believe, to the action of the heat during its preparation. A large proportion of the aloes and of the myrrh is soluble in solution of carbonate of potassa, even without the aid of heat, the insoluble parts being, according to some eminent authorities, more highly oxidized in their constitution, and more irritating in their effects, than those that are dissolved by this menstruum. By the continued application of heat, a change is effected in the soluble constituents, which are thus rendered to a certain extent insoluble, while the mucilage of the myrrh, together with the extract of liquorice, tend to prevent the immediate deposition of the insoluble particles: a portion of the volatile oil of the saffron is also driven off during the boiling.

Thus upon the care bestowed in preparing it—upon the degree of heat applied in the boiling, will, in a great measure, depend the constitution and the effect of the medicine; and as it is impossible, according to the instructions of the college, to define or to regulate exactly the heat applied, it follows as a necessary consequence, that decoction of aloes made according to the Pharmacopœia, is seldom met with twice alike.

A preparation possessing, we believe, all the properties of that

designed by the college, and not subject to the same variations, may be obtained by making an *infusion* instead of a *decoction*, and, we trust, the college in a future edition of their Pharmacopœia will consider the propriety of making this alteration in the formula: it would be in strict accordance with the mode of proceeding directed in another case, namely, that of the purified extract of aloes, in which the aloes is ordered to be macerated with the water at a gentle heat for three days, and the clear liquor decanted from the dregs.

MACHINE FOR SEPARATING THE FINE FROM THE COARSER PARTICLES OF POWDERS.

A CORRESPONDENT, who subscribes himself "G. T. P. (Manchester)," recommends for this purpose a tall upright box, supported on four legs. The bottom is to be taken out, and a piece of leather nailed securely on it, which, being larger than the bottom, hangs down like a bag. The upper part of the box is furnished with trays, at intervals of a few inches, from the top to the bottom, and supported on ledges, but not extending entirely across the box. The powder, as it comes from the mortar, is to be placed in the bag, which is to be beaten with a stick from below. The finer particles will naturally rise in the box and fall on the trays, which may be removed and emptied as occasion requires.

Our correspondent observes, "The principle is similar to that by which Creta ppt. is directed to be made, with this difference, that the medium in which one is suspended is water, and the other air. The powder will not be of the same fineness on all the shelves; it will be finer on the top than on the bottom."

RESEARCHES ON NITRIC ACID.

BY M. E. MILLON.

THE usual method of purifying nitric acid consists principally in separating the hydrochloric and sulphuric acids. The processes employed for this purpose do not effect the separation of nitrous acid. This acid generally exists in nitric acid, even when it is much diluted and quite colourless. To show the influence of this nitrous portion, it will be found that a weak acid containing any traces of it, will precipitate iodine from the iodides, and sulphur from the monosulphurets; that it will colour the protosalts of iron brown, and the ferro-cyanide of potassium green; while the same acid, if perfectly pure, decomposes the monosulphurets without causing a precipitate, separates no

iodine from its combinations with the alkaline metals, and does not colour the protosalts of iron or the ferro-cyanide of iron.

It may be added, that indigo, the colour of which is destroyed by the ordinary nitric acid, when diluted to a certain extent, retains its colour unchanged in contact with a considerable quantity of pure nitric acid; and the intense green colour which is developed by the ordinary nitric acid in urine, which is supposed to have a portion of the colouring matter of the bile in it, is also due to the presence of nitrous acid.

Nitric acid, with one equivalent of water, cannot be distilled without being decomposed. Moreover, it appears difficult to obtain the pure acid by the processes which have been hitherto adopted. I have always obtained an acid by these processes containing a considerable quantity of nitrous acid, although the proportion of water has been varied. Thus I have been obliged to adopt a new method of preparation, by which an acid is obtained that is perfectly white, and is not coloured by the action of light, even at a temperature of from 80° to 100° Fahr.

I have taken much pains to determine all the hydrates of nitric acid that can be obtained by distillation, and the regret I have felt in finding so few details mentioned by those authors who have investigated the subject, has induced me, in the memoir presented to the Academy, and from which this paper is extracted, to describe with minuteness all the circumstances attending my experiments. It is also, upon this exact determination of the hydrates, that my conclusions are principally founded.

Besides the acid, with one equivalent of water, I have obtained acids with two, with four, and with four and a half equivalents of water. I have been unable to fix any other proportions, by means of distillation.

The constitution of these hydrates has led me to repeat the analysis of some of the nitrates. Mr. Graham had already fixed the composition of the nitrates of zinc, of magnesia, of copper, and of bismuth; but his statement of the constitution of nitrate of zinc has been called in question, and his conclusions seem to be rather too general, in reference to the oxides of the magnesian class.

I have, therefore, repeated the analysis of the nitrates of zinc and magnesia; I have also added those of the nitrates of manganese and cobalt, and have reviewed the analysis of nitrate of nickel, as given by previous authors. All these nitrates contain six equivalents of water, as Mr. Graham showed with regard to one, and anticipated with regard to the others. But lime forms an exception to the magnesian series, in its nitrate as well as

its sulphate. The nitrate of lime contains but four equivalents of water, and there are other hydrates in which the proportion of water is still smaller. Although it easily parts with all its water *in vacuo*, it is susceptible of forming several basic nitrates by boiling it over hydrate of lime.

Nitric acid appears to be ill adapted for forming a series of combinations, in the same manner as phosphoric acid, and forms an evident exception to the general formula which Mr. Graham seems disposed to adopt.

The action of nitric acid on chlorate of potash forms a much more effective source of oxidation than those hitherto employed, for certain substances, such as sulphur, selenium, or organic substances. Spongy platinum withstands this action completely, as also is the case on exposing it to a temperature of 290° Fahr., in contact with nitric acid and chlorine in the nascent state. This fact appears to me important in reference to the theory of oxidation, to which I am led by the action of nitric acid on the metals.

In the course of my investigations, which are here briefly alluded to, I observed that weak nitric acid, perfectly pure, exercises no action on copper, and that the same is the case with several other metals, such as bismuth and mercury. This fact was not previously known. It was known that nitric acid, when highly concentrated, does not act on some metals, such as iron and tin; but this same acid, when diluted, has been considered one of the most energetic oxidators of these metals. This is not the case, however, and if we might establish a general rule in regard to the action of pure nitric acid on the metals, it would be, that it attacks none of them, excepting the alkaline metals.

This proposition requires elucidation, and I commence with the explanation of the circumstances observed in regard to copper.

An acid of specific gravity, 1.070, does not attack copper at a temperature of 68° Fahr. More concentrated, it attacks it with energy; but, if a current of deutoxide of azote be passed over the copper, covered with the acid, which otherwise is without action upon it, or still better, if a few drops of a concentrated solution of nitrite of potash be added, the action on the copper commences, and when once commenced, continues for several hours, provided the quantities of metal and acid are sufficient. When the reaction has lessened, or entirely ceased, as occurs after some hours, it may be renewed by a fresh addition of nitrite, and according as you desire the action to be, greater or less, a larger or smaller quantity of the nitrite should be added.

I tried whether a current of any gas traversing the acid

would give rise to the same action, but found this was not the case with carbonic acid, hydrogen, oxygen, and protoxide of azote. I decomposed in the midst of the acid, carbonate and chloride of lime, and sulphuret of potassium; the carbonic acid, the chlorine, and the sulphuretted hydrogen were disengaged, without causing any reaction.

If the oxidation were entirely due to the deutoxide of azote, we should be able, on removing that gas all at once, to arrest the action. This in fact takes place, on the addition of protosulphate of iron; the action when in full activity, is suddenly stopped.

A slight elevation of temperature, as I have already remarked, being sufficient to induce the oxidation of the copper, even in the pure acid of specific gravity 1.070, I thought that possibly the heat caused by the decomposition of the nitrate, gave rise to the re-action. I therefore made a mixture of ice and salt, into which the metal and acid were placed while the oxidation was going on briskly: the disengagement of gas stopped as the acid began to congeal; but on withdrawing the glass tube with which the experiment was made, from the freezing mixture, and gradually applying a temperature of about 68° Fahr., the oxidation recommenced with activity, and I was thus enabled, with the same acid and metal, to stop or resume the action several times, by successive coagulations.

This suspension of the disengagement of gas by the application of cold, completely isolated the action of the deutoxide of azote from any influence exercised by caloric. I have been surprised at the decomposition of the pure diluted nitric acid by copper, at a temperature not high enough to decompose the acid, nor sufficiently prolonged to effect its concentration. I have endeavoured therefore to determine the influence of temperature upon acid of different degrees of concentration.

I commenced with the well-known case in which copper is not acted upon by fuming nitric acid. Nitric acid in a state bordering on its maximum of density, that is, of specific gravity 1.552 requires a temperature of 68° Fahr. I have entered very fully into the consideration of this case, in my memoir presented to the Academy.

The pure acid, with one equivalent of water, attacks the copper with extreme violence at 68° Fahr., the same is also the case at this temperature, with the acids of four and of four and a half equivalents of water, and of all the intermediate densities, to that of 1.070.

But if acids of various degrees of density, from that with one equivalent of water to the acid of specific gravity 1.070, be placed in glass tubes and kept in a freezing mixture, it will be

found that the copper will remain unaffected in all these acids, with some modifications according to the state of the acids.

In the acid with one equivalent of water, the copper becomes covered with a blueish coating, and the liquor assumes a slightly green tint. But the action goes no further, and it will not be extended even when the tube is removed from the cooling mixture, and becomes of the temperature of the atmosphere. I have kept some copper in this way for several days, at a temperature of 68° Fahr. The blue coating formed on the surface of the copper, is insoluble in concentrated acids, but very soluble in water.

The acids of four and four and a half equivalents of water, and other weaker acids, leave the metallic lustre of the copper unaffected whilst it remains in the cooling mixture; but when taken out, the acids of four and of four and a half equivalents, cause the copper to be covered with a blue coating; the action however proceeds no further, at least without the frequent shaking of the tube; whilst the weaker acids commence their action as soon as the temperature is a little raised. The moment of the action commencing, always varies according to the concentration of the acid. Thus, acid of specific gravity 1.217 commences its action at 14° Fahr., acid of 1.108 commences at 28° Fahr.

The gases which result from the oxidation, are also different according to the temperature and the degree of concentration. Humboldt has already remarked in his memoir on the Analysis of Air, that the purest deutoxide of azote is obtained by the action of weak nitric acid on copper. If at the same time, the temperature be not raised, the gas will be completely absorbable by protosulphate of iron. Acid, the action of which is accompanied with a great disengagement of heat, affords a gas which is always mixed with azote. Finally, the acid of 1.217 of which the action commences at 14° Fahr., affords very little binoxide, but a great deal of protoxide of azote, if kept at that temperature.

It may be concluded from the experiments cited, that the oxidation of copper by nitric acid, is dependent, first, on the concentration of the acid; secondly, on the temperature; thirdly, on the presence of deutoxide of azote; fourthly, on the solubility of certain products in the acid in which they are formed.

These principles extend to all the metals, but in each one certain modifications are presented, the most important of which it is necessary to be acquainted with.

Silver comes under the same class as copper, so also does mercury, but this metal is completely attacked by the acid with one equivalent of water, although the product which is formed is insoluble in the acid; the continued action of the acid in this

case is due to the mobility of the particles of mercury, which successively present new points of action.

Bismuth and tin afford peculiar phenomena. The bismuth preserves its metallic brilliancy at 68° Fahr., in acids of one and of two equivalents of water; but a less concentrated acid, of four or four and a half equivalents, attack it with extreme violence. If the acid be still further diluted, so as to reduce the density to 1.108, the metal will be unacted upon; it will require the concurrence of heat and of deutoxide of azote to commence the action; when once commenced, it is affected by sulphate of iron and the freezing mixture, in the same manner as copper.

Tin differs but little from bismuth, Zinc takes a position peculiar to itself. The acids of one and two equivalents of water do not attack it when in a freezing mixture, the temperature of which should be 0° Fahr. or lower. The metal becomes covered with a slightly yellowish white coating, which preserves it from subsequent action, whilst it remains in the cooling mixture, but which, no doubt, is soluble at a higher temperature, for when the tube is removed from the mixture, the action is developed with violence, and all the metal is found dissolved.

In acid of four and four and a half equivalents, and even in weaker acid, the zinc, which is attacked with great energy at a temperature about 32° Fahr., preserves its metallic brilliancy in the same acid at a lower temperature. If the surrounding temperature be gradually raised, the action is renewed with all its energy.

Lastly, The weak acids all attack the zinc, notwithstanding the lowering of the temperature.

It will be seen that the oxidation in these cases follows a course almost always the reverse of those of tin and bismuth.

It was not until after having carefully studied all the re-actions which I have described, that I ventured to undertake those of iron. I found them described with so much minuteness and care, that I repeated my experiments several times before giving full credence to the results.

Small balls of iron, well polished, placed in nitric acid of one and two equivalents of water, are covered with a coating sometimes black, sometimes blue, sometimes blue inclining to yellow, and at the same time bubbles of gas are formed which dissolve. The iron, thus covered, is not further acted on by any acid, weak or concentrated, at least without increasing the temperature. This coating evidently presents the characters of protoxide of iron, which I have found to be unacted upon by all the nitric acids, whether it be obtained by the combustion of iron in oxygen, or by passing a strong voltaic current through fine wire, or even by acting on the small iron balls such as I have used.

In this case the iron is somewhat analogous to zinc, for, as

the coating formed by the action of the concentrated acid is soluble in that acid, the metal is not preserved by it, if the temperature be a little raised, or the acid diluted with water.

In acid of four and four and a half equivalents of water, and even a little weaker, the iron preserves all its metallic brilliance, but the action commences with energy as soon as heat is applied.

In this second case the iron has a perfect analogy to zinc.

Lastly, I take a very weak acid, or add water to the acid in which the iron preserves its metallic lustre, and immediately the action commences, but without violence, giving rise to the formation of the green nitrate, first noticed by Thénard.

It will thus be seen that the analogy holds good in each case between zinc and iron, with one simple difference, that oxidation is always promoted by a slighter increase of temperature in the case of zinc.

Antimony and arsenic are distinguished from all the other metals which I have examined.

Arsenic is not attacked at the ordinary temperature of 68° Fahr. by any pure or nitrous acid, whatever may be its state of concentration.

Antimony is only attacked by the most concentrated acids, but slowly, without gaseous effervescence.

A mixture of nitric and hydrochloric acids does not act well on these metals, whilst the two acids do not re-act on each other, which is the case, whatever be their concentration, or the heat applied, when perfectly pure. But if, after adding either antimony or arsenic, to a mixture of these two acids, greatly diluted, a few drops of the nitrite be added, the action will immediately commence, as in the case of copper and bismuth.

The mixture of nitric and hydrochloric acids, then, if they are neither sufficiently concentrated, nor sufficiently heated to form *aqua regia*, remain without action. It is of no use to pass a current of chlorine gas through it; it is necessary to add a nitrite, or at least to give rise to the formation of *aqua regia*, so as to ensure the presence of nitrous acid. The hydrochloric acid furnishes at the same time a solvent, and a decomposing agent for the production of the nitrous acid.

Platinum corresponds with arsenic and antimony, except that a higher temperature is required to induce the action. Yet, even at the ordinary temperature of the atmosphere, in a mixture of hydrochloric and nitric acids, too weak for the formation of *aqua regia*, platinum, under the influence of nitrite of potash, is sufficiently acted upon to furnish a liquor charged with platinum, and affording abundance of crystals of the double chloride of platinum and potassium studding the sides of the glass. But two or three days are required for the production of this effect, and several successive additions of nitrate of potash.

I will here add two facts, which seem to me to elucidate the theory of the action of *aqua regia*.

1st. Spongy platinum left for twenty-four hours in contact with bichloride of hydrogen, which constantly furnishes chlorine and hydrochloric acid, does not lose the hundredth part of a grain of its weight.

2dly. In the presence of nascent chlorine and nitric acid, at a temperature of 290° Fahr., conditions in which the action of nitric acid on chlorate of potash is developed, spongy platinum is not dissolved, is not oxidized, and does not lose one-hundredth part of a grain of its weight.

To sum up, it may be said, that nitric and hydrochloric acids, mixed; that nitric acid and chlorine, mixed; that hydrochloric acid and chlorine, mixed, do not act upon platinum; but by the intervention of deutoxide of azote, in the presence of a solvent, and with the aid of a sufficient temperature, platinum is acted upon. The same principles, the same influences which are concerned in the solution of platinum, apply also to arsenic, antimony, and the other metals. But what is the product resulting from the action of deutoxide of azote on nitric acid? For it will be seen that this forms the last point in the problem, a very simple experiment resolves this question.

If deutoxide of azote be passed through nitric acid, and this be afterwards put into a freezing mixture, it may be saturated with an alkali or its carbonate, without the disengagement of any trace of deutoxide of azote, and the product will be found to be a nitrite.

The deutoxide of azote in the presence of nitric acid, therefore constitutes a combination and not a solution. It is this nitrous acid, at different temperatures, under the conditions best suited for the solution, that produces the oxidation of the metals. We can thus understand how it is that platinum is dissolved at the same time as silver, when the alloy of these two metals is acted upon by nitric acid. According to the general rule applying to the oxidations I have described, it may easily be explained; the nitrous acid forms nitrites of copper, of mercury, of silver, which as they are formed, are dissolved by the nitric acid; this solution gives rise to the formation of deutoxide of azote, which, combining with the nitric acid, forms a fresh portion of nitrous acid, the result of which is a recurrence of these phenomena. Thus the phenomena of propagation, which appear so extraordinary at first sight, depend upon the simple circumstance of an acid composed of azote and oxygen, giving up part of its oxygen to the metal, and admit of being explained upon the ordinary principles of chemical affinity.—*Comptes Rendus.*

PREPARATION OF HYDROCYANIC ACID.

BY M. LIEBIG.

The cyanide of potassium (prepared according to the method described in page 88 of our last number) is much better adapted than the ferro-cyanide for the preparation of hydrocyanic acid —a much larger product is obtained, and with greater facility in the distillation.

During the distillation of ferro-cyanide of potassium with diluted sulphuric acid, there is deposited, as is known, a blueish white powder, a combination of cyanogen, potassium, and iron, the composition of which is similar to that of the ferro-cyanide of zinc, and is expressed by the formula:

$$\left.\begin{matrix} \mathrm{K} \\ 2\ \mathrm{Cfy} + 3\ \mathrm{Fe} \end{matrix}\right\} \quad (\mathrm{Cfy} = \mathrm{Cy_6\ Fe})$$

It will appear from the formation and composition of this body, that five atoms of ferro-cyanide of potassium, containing thirty atoms of cyanogen, will not afford more hydrocyanic acid than nine atoms of cyanide of potassium would, that is to say, only eighteen atoms, the other twelve atoms remaining in the blueish white ferruginous precipitate.

If the ferro-cyanide of potassium be transformed into cyanide (according to the process described in page 88 of our last number) twenty-five atoms of hydrocyanic acid may be obtained from five atoms of the ferro-cyanide, consequently seven atoms more than in the other way.

In effecting the decomposition of one atom of ferro-cyanide of potassium with sulphuric acid, it is generally directed to use a sufficient quantity of the latter to form with the alkali an acid sulphate of potash; in using the cyanide of potassium, there need only be added one atom of the hydrated sulphuric acid.

Equal parts of cyanide of potassium and hydrated sulphuric acid are the best proportions for preparing hydrocyanic acid; the sulphuric acid will form a neutral sulphate with the potash, and an acid sulphate with the ammonia resulting from the decomposition of the cyanate of potash. The cyanide of potassium should be dissolved in double its weight of water, and the sulphuric acid diluted with three times its weight of water, gradually added by small quantities at a time, allowing the effervescence which takes place to subside after each addition of the acid.—*Annalen der Chemie und Pharmacie.*

PREPARATION OF CYANATE OF POTASH.

BY M. LIEBIG.

The cyanide of potassium (prepared according to the method described, page 88, in our last number) offers an excellent means for easily and economically procuring the cyanate of potash. In the preparation of this salt, the common litharge of commerce should be used, previously submitting it to a dull red heat.

Fuse a portion of cyanide of potassium in a Hessian crucible, and throw in a small quantity at a time of litharge reduced to powder, the oxide of lead is immediately reduced, and remains mixed in the form of a fine powder with the cyanate of potash, which is produced; but on increasing the heat, the metal fuses into a regulus. Decant the melted salt, and when cooled and powdered, boil it with alcohol until no more crystals are obtained on cooling the solution. The crystallization of the cyanate of potash from alcohol is not necessary in the preparation of urea.—*Annalen der Chemie und Pharmacie.*

NEW METHOD OF PREPARING CHLORIDE OF ZINC.

BY M. RIGHINI.

Take of

Chloride of barium, pure and crystallized, ℥xxss.
Sulphate of zinc, pure, ℥xxvss.
Distilled water, ℥xxxj.

Dissolve the sulphate of zinc in one-half the water, and the chloride of barium in the other half; mix the two solutions in a matrass, apply the heat of a water-bath for a few minutes only, to accelerate decomposition; filter, and evaporate the liquor over a water-bath, until reduced to about two ounces, put this on to a fresh filter, on which has been placed some animal charcoal with a few grains of powdered chloride of barium; evaporate the filtered liquor until the product left to itself presents the appearance of flakey crystals of a brilliant whiteness, which when dried, must be kept in a well-stopped bottle.—*Journal de Chimie Médicale.*

HYPOSULPHITE OF SODA.

Berzelius proposes the following as a simple and easy method of preparing the hyposulphite of soda, now extensively used in photography:

Saturate a solution of carbonate of soda with sulphurous acid gas, so as to form a bisulphite of soda. Boil a weak solution of hydrate of soda with sulphur to saturation. Add the latter solution to the former until there shall be a slight excess of sulphuret of sodium; filter, evaporate, and crystallize. The salt thus obtained, when freed from the mother liquor, will be hyposulphite of soda.

DANGER OF ADMINISTERING SULPHATE OF POTASH,

AS A PURGATIVE, TO WOMEN AFTER CONFINEMENT.

BY M. CHEVALLIER.

The author states, that pharmaceutists ought to exercise some precaution in supplying sulphate of potash, when ordered in doses of one, two, or four drachms, for women after confinement, unless prescribed by a medical man, as it seems capable, in some cases, of producing dangerous and even fatal effects.

A case is mentioned, in which a medical practitioner having administered two drachms of this salt to a female who had recently been confined, symptoms supervened which led to the supposition that the patient had been poisoned.

In another case, ten drachms of sulphate of potash were ordered to be taken in six doses. The patient died in two hours after taking the first dose. On analyzing the contents of the stomach after death, no other substance could be detected, to which the effect could be ascribed, besides the sulphate of potash.—*Journal de Chimie Médicale.*

CURCUMINE,

THE COLOURING MATTER OF TURMERIC.

BY M. VOGEL.

In this paper the author gives the following as the conclusions, to which he has arrived from the investigation of the subject:—

1st. That curcumine may be obtained in a state of purity, by separating it from its combination with oxide of lead.

2d. That concentrated sulphuric, phosphoric, and hydrochloric acids, dissolve curcumine, and that it may be thrown down from these solutions in a flocculent precipitate by means of water.

3d. That nitric acid decomposes it, forming a yellow substance, somewhat resembling the resins.

4th. That it forms brown combinations with the alkalies, and may be separated by weak acids.

5th. That it assumes a much deeper colour with the salts of uranium, than with those of lead, or with the alkalies.

6th. That the soluble borates form grey combinations, more or less decided.

7th. That turmeric paper reddened with boracic acid, is not restored to yellow by acids, but assumes a blue tint when wetted with ammonia, and also more or less with the other alkalies.—*Journal de Pharmacie.*

ON HYDRATED PEROXIDE OF IRON,

AS AN ANTIDOTE FOR ARSENIOUS ACID.

BY WM. PROCTER, JUN.

The American Journal of Pharmacy for April last, contains an interesting paper on the above subject, in which the author, Mr. Procter, jun. gives the result on his investigations, with the view of determining the relative power of the hydrated peroxide of iron, as an antidote for arsenious acid, in the recent state, and when kept for different periods of time. The following are the results to which he has arrived, and which will be seen to be somewhat at variance with the opinions which have hitherto been generally received.

1st. That hydrated peroxide of iron, even when kept under water, gradually decreases in its power of neutralizing arsenious acid.

2d. That if kept in the form of a thick magma, it will retain its properties longer than when mixed with much water.

3d. That this decrease in power is probably due to a change in the relative proportion of the oxide and the water chemically combined with it, as well as to an alteration in its state of aggregation.

4th. That from the experiments of Orfila and others, the dry hydrated oxide possesses the power to a considerable extent of neutralizing arsenious acid, and it should be used in the absence of the moist and recent preparation.

5th. That hydrated peroxide of iron may be obtained in a state fit for use in ten or fifteen minutes, by using a solution of the persulphate of iron; and,

Lastly, That the recent oxide should be used in all cases where it is attainable, in preference to that long kept.

BOOKS RECEIVED.

Monographie du MADI CULTIVÉ *ou* MADIA SATIVA. *Par* VICTOR PASQUIER, &c. &c. pp. 133.

MADIA is a Chilian plant, which was introduced into Europe by M. Buch, gardener to the King of Wirtemberg. It belongs to the section *Asteraceæ*, of the natural order *Compositæ*, is an annual plant, and has been readily naturalized to a European climate. The root is fusiform; the stem cylindrical, hairy, branching at the summits, and furnished with sessile, three to five longitudinally-nerved leaves, which are semi-amplexicaul, opposite on the lower portion of the stem, and alternate on the upper; linear, lanceolate, entire, bright, hairy; and the higher ones excreting from the hairs a viscid fluid. The flowers are terminal and axillary, of a pale yellow colour, the disk florets tubular, the ray ligulate; the involucrum is globular, consisting of scaly, unequal, lax, lanceolate, acute, velvety, viscid leaflets, disposed in two ranks. The fruit, like that of the order to which the plant belongs, is an *achenium*, smooth, angular, convex on one side, flat on the other; and devoid of pappus.

The whole plant is viscid, and exhales a powerful odour, which is somewhat like heated honey. It flowers in July and August. It requires rather a rich soil, of a ferruginous character.

M. Pasquier has entered minutely into the mode of preparing the soil for receiving the seed, directions for sowing it, and for weeding, transplanting, and harvesting the produce, as well as the mode of drying the plant, and separating the seed. He next proceeds to examine the constitution of the seed, 100 parts of which consist of 26.5 of testa, and 73.5 of kernel; 100 parts of the latter of which yields 31.3 of vegetable albumen, gum, and lignine, 56 of *fixed oil*, and 12.5 of water. In dry seasons, the oil is both more abundant and better than in damp seasons. The produce of oil compared with that of the poppy, is equal; with colza, as 32 to 28; with linseed, 32 to 21; with the olive, 32 to 16. The leaves and stems of the plant are rejected

by cattle; but the oil-cake, which always retains a considerable portion of the oil, forms a nutritive food for cattle, who are fond of it.

The oil of Madia, expressed without heat, is transparent, of a golden yellow colour, inodorous, rather fatter than the oil of rape or olives, and of a soft, agreeable, nutty taste; and is fit to be employed in the preparation of food, in salads, and for all the purposes of the best and mildest fixed oils. It burns with a brilliant reddish-white flame, and leaves no residue. It is little liable to become rancid, and is completely decolorized by animal charcoal. It dissolves sulphur, phosphorus, and wax; and is soluble in ether, but insoluble in alcohol. M. Pasquier, also details the action of the acids, the alkalies, and the metallic oxides upon this oil, in which it is unnecessary to follow him.

On Diseases *of the* Bladder *and* Prostate Gland. By William Coulson. *Longman, Brown, Green, and Co.*

An Essay on Diabetes. By H. Bell, D.M.P. *Translated by* Alfred Markwick. *Highley, Fleet Street.*

Although these works are designed for the Medical Practitioner more than the Pharmaceutical Chemist, yet they contain matter that would be read with interest by many of our members. The Chemist is sometimes applied to, in the treatment of diabetes, for the determination of the amount of sugar contained in the urine; and he may often in other ways assist the medical attendant by ascertaining the nature of the chemical changes which take place in the secretion. Mr. Coulson, indeed, in his interesting and valuable book, has availed himself of the investigations of one of our members in the chemical department of his subject.

"For the following observations," he says, "on sulphur, phosphorus, chlorine, lime, and magnesia, I am indebted to my friend Mr. John T. Barry, one of the best practical chemists of our time.

"*Sulphur.*—No fact in chemistry is better established than the existence of sulphur in the blood: nor is its existence less certain in urine. There is, however, this remarkable difference between the two:—In the blood very little* is in the state of sulphuric acid; while in the fluid derived from that same blood and passed by the kidneys, the greater part of the sulphur is found to be oxidated to its maximum—that is, converted into sulphuric acid, and neutralized. The question then arises, Whence is the requisite oxygen supplied?"

We have already devoted so much space to the subject of Animal Chemistry, in this number, that we must refrain from quoting the further details of Mr. Barry's investigations, and refer the reader to Mr. Coulson's work, in which they are described.

* Berzelius says, that none at all was found in his experiments; probably with ox blood. I found a distinct trace of sulphuric acid in human serum, though insignificant in quantity as compared with what exists in the urine.—J. T. B.

UNIVERSITY OF LONDON.*

QUESTIONS AT THE EXAMINATIONS IN CHEMISTRY, BOTANY, AND MATERIA MEDICA.

BACHELOR OF MEDICINE.—FIRST EXAMINATION. PASS EXAMINATION.

TUESDAY, August 2.—Morning, Ten to One.

CHEMISTRY.

Examiner, Professor Daniell.

1. A solution of a Salt is contained in a bottle marked A, placed before you, with appropriate tests—of what acid and base is it composed? what are their equivalent numbers upon the Hydrogen scale? and what is the nature of the changes produced by the tests?
2. A solution of another Salt marked B, is also placed before you, with appropriate tests—what is the acid of the salt? what its probable base, its equivalent number, and the nature of the changes produced by the tests?
3. What is meant by the Atomic Theory? State its leading doctrines, and explain them by examples.
4. How may the Chemical Equivalent of a substance be determined?
5. What advantage is there in stating the proportions of the ingredients of compound bodies in Equivalents over a statement of the same proportions per cent?
6. What do the following symbols represent:

$$SO_3,\ NH_3,\ HO{=}SO_4,\ NH_4\ ?$$

and what is the theory to which the equation refers?
7. What general principle do we avail ourselves of for the measurement of temperature, and how is it applied?
8. Describe the construction and explain the action of the Electrophorus.
9. What are the forces which may be developed by a Voltaic Current? Briefly exemplify each when called into action.

BACHELOR OF MEDICINE.—FIRST EXAMINATION. EXAMINATION FOR HONOURS.

FRIDAY, August 12.—Morning, Ten to One.

CHEMISTRY.

Examiner, Professor Daniell.

1. What is meant by *specific* and *latent* Heat? Explain with reference to examples, and state the general modes of estimating each.
2. What is meant by the Polarization of Heat? How may Heat be polarized?
3. State Dr. Faraday's theory of Electrical Induction, and the principal facts upon which it is founded.
4. How is the force conducted in the different parts of a Voltaic Circuit? and what is the law of its conduction?

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* We have received from the University a list of the names of the successful candidates, but our space does not admit of their publication.

5. Having obtained the amount per cent. of Carbon, Hydrogen, and Oxygen in a vegetable substance as follows :

C 42.4
H 6.5
O 51.1

100.

how would you proceed to calculate its composition in equivalents? and how might the result be confirmed?

6. What is the view which must be taken of the Monobasic, Bibasic, and Tribasic Phosphates upon the Binary Theory of Salts?

7. What are the principal chemical characters of Lithic and Phosphatic Calculi?

8. What is the constitution of Urea? How may it be formed artificially? and how may it be detected in the urine?

BACHELOR OF MEDICINE.—FIRST EXAMINATION. PASS EXAMINATION.

TUESDAY, August 2.—AFTERNOON, Three to Six.

BOTANY.

Examiner, PROFESSOR HENSLOW.

1. Distinguish between prickles, thorns, and bristles.

2. Explain the structure of a Cremocarpium.

3. Compare the principal structural differences in the flowers and fruit of Clematis, Anemone, Ranunculus, Helleborus, and Pæonia, upon which five subordinate groups or tribes of Ranunculaceæ depend.

4. What is the chief characteristic difference in the structure of the flowers of plants grouped under the tribes Alsineæ and Sileneæ?

5. How are the leaves disposed in Chenopodiaceæ, and have they stipules or not?

6. How is the origin of the vesicles of the cellular tissue explained?

7. Explain the general process of fertilization; and describe its peculiar modifications in Orchidaceæ. Describe the specimens marked,

8. }
9. }
10. }

BACHELOR OF MEDICINE.—FIRST EXAMINATION. PASS EXAMINATION.

TUESDAY, August 2.—AFTERNOON, Three to Six.

MATERIA MEDICA AND PHARMACY.

Examiner, DR. PEREIRA.

1. Describe the mode of preparing Tartaric Acid according to the London Pharmacopœia. Explain the chemical changes which occur in the process. State the atomic constitution of the acid in both the dry and crystallized states. Give the tests by which the acid may be distinguished from other vegetable acids, and by which the absence of the Bitartrate of Potash in its powder may be ascertained. Lastly, State what are the quantities of Car-

bonate of Potash (the granulated salt of the shops), Bicarbonate of Potash (crystallized), Carbonate of Soda (crystallized), *Sodæ sesquicarbonas*, Ph. Lond., and *Ammoniæ sesquicarbonas*, Ph. Lond., which are respectively required to saturate one scruple of the crystallized acid.

2. You are requested to give a botanical description of *Hyoscyamus niger*; describing successively the root, stem, leaves, flowers, fruit, and seeds: stating its duration, and its position in both the Sexual System of Linnæus and the Natural System of De Candolle. Mention the principal symptoms which characterize its operation on the system in both medicinal and poisonous doses. State in what cases its use is preferable to that of opium, and in what doses you would administer the Tincture and Extract.

3. Briefly state the circumstances which favour the view that the absorption of a medicine is necessary to the production of its remote effects.

4. In what cases are Ferruginous Tonics to be preferred to the Bitter Vegetable Tonics?

5. What is the specific gravity of *Spiritus rectificatus*, Ph. Lond., and of *Spiritus tenuior?* What are the relative proportions, by volume, of rectified spirit and water which are required to constitute proof spirit? By what tests is the presence of *Oil of Corn Spirit* in Rectified Spirit to be detected?

6. What quantities of the following preparations contain respectively one grain of Opium:—*Confectio Opii, Pilulæ Saponis Compositæ, Pulvis Cretæ compositus cum Opio, Tinctura Opii, Tinctura Camphoræ composita*, and *Pulvis Ipecacuhanæ compositus?*

BACHELOR OF MEDICINE.—FIRST EXAMINATION. EXAMINATION FOR HONOURS.

FRIDAY, August 12.—AFTERNOON, Three to Six.

MATERIA MEDICA AND PHARMACEUTICAL CHEMISTRY.

Examiner, DR. PEREIRA.

1. Describe the method of obtaining *Oil of Vitriol.* Explain the theory of the process. How would you detect the presence of Lead, Nitrous Acid, and Arsenious Acid in Oil of Vitriol?

2. What are the salts with which commercial Bromide of Potassium is frequently contaminated, and by what tests can you detect them? What are the characters of pure Creasote? By what means would you ascertain whether *Ferri Potassio-Tartras*, Ph. Lond., has been properly prepared?

3. What effect on the gums is produced by the absorption of Lead?

4. In what cases are Mercury and Iodine respectively indicated as resolvents? And what are the circumstances which lead you to prefer the one or the other of these medicines?

5. By what botanical characters would you distinguish *Conium maculatum* from *Æthusa Cynapium?* By what characters is the fruit of *Conium maculatum* distinguished from that of *Pimpinella Anisum?*

6. By what test is the presence of *Salicin* in the decoction of Willow-bark to be ascertained?

7. What are the effects and uses of *Lobelia inflata?* In what form and dose would you administer it?

8. Name the substances respectively numbered 1, 2, 3, 4, 5, 6.

TO CORRESPONDENTS.

"J. H. P., Leeds." The leaves are cynanchum.

"M P. S.," Liverpool. The crystals are chloride of sodium, which is not unfrequently found in old extract of hyoscyamus, as the salt exists in the plant.

"R. L. M. P. S." enquires, Whether, in the following prescription, the carbonate of potash of the present Pharmacopœia should be used?

℞ Lig. Sedat. Batt. ʒss.
Ext. Taraxaci ʒj.
Sp. Cinnam. ʒiij.
Syr. Aurant. ʒiij.
Inf. Rhei. ℥vss.
Potassæ Carbon. ʒj. M.

If the prescription be correctly prepared, there is no alternative. If the writer intended bicarbonate to be used, he is responsible for the error. In this instance we have no means of judging which salt was *intended.*

Tinct. croci is ordered in the Edinburgh and Dublin Pharmacopœias as follows: ℞ Croci Stig. ℥j.
Sp. Vini. Ten. ℥xv.

"T. G. E. A. P. S." enquires, What decomposition takes place on adding sp. lavand. co. to liq. plumbi diacetatis? The colouring matter of red sandal wood, *santalin* of Pelletier, forms insoluble precipitates with several metallic solutions, among which is that of acetate of lead.

"An Associate, Sheffield," has sent a form for ung. hyd. nit. in which *nut oil* is one of the ingredients. As this substitution has already been proposed, we think it unnecessary to publish the paper, especially as the formula is a deviation from the Pharmacopœia.

"W. N. S." describes an experiment which he has contrived for freezing water by the sudden liberation of carbonic acid under great pressure. Although we give our Correspondent credit for originality, the principle of the process is not new, as we have seen mercury frozen in a similar manner.

"T. J. M."—*Castile* soap should be used in making linimentum saponis.

"Pershore." We are not in possession of "a receipt for polish blacking, warranted not to come off and soil."

"An Associate" (Bolton) writes for the formula of the Solar Tincture, invented, he believes, by Aristotle. The following is most likely the article alluded to:

Aurum Potabile, or Tinctura Solis. *Hippocrates, L.* 1, *de Diæta, text* 47.—"℞ Calcem ☉, per ℞ factum, reverberatione, in summam porositatem et brunnitatem redactum, affunde ☿ microsmic, digere l. calore per mensem vase H clauso; donec sanguinis instar rubicunda tinctura evadat. Hinc decanta, et affunde novum menstruum, idque toties repete, quoties opus. Solutiones collectæ per octo et duodecim dies digerantur. Hinc lenissimo calore menstruum (in similes usus reservandum) in MB separetur. Sic remanet tinctura in fundo forma ₀°₀ rubicundissimi, in quolibet liquore solubilis, quæ vicem ☉ potabilis supplere potest. Eandem solutionem si loco MB in arenâ per cucurbitam vel retortam destîlles: tandem ☉ tinctura simul per XX transit, rubicunda instar sanguinis, relictâ in fundo terrâ acidâ nigrâ, spongiosâ. Tinctura à menstruo suo in MB saltem tepido liberata ulterius exaltari potest, si aliquoties in ☿ solvatur, ac spiritus idem per destillationem à tincturâ abstrahatur."—*Pharmacopœia Schröderi Medico Chimica.*

"An Associate" (Manchester) enquires which is the best and *cheapest* way of making Gallic Acid? Enquiries of this description, involving pounds, shillings, and pence, are not easily answered. Those who are not manufacturers are not likely to know, and manufacturers are not likely to tell the secrets by which they live.

Mr. Ladbury, of Wednesbury, has sent the following formula for concentrated camphor julep :

℞ Spirit Camphoræ, ℥iij.
Tinct. Myrrh, ℥iv.
Sp. Rectif., ℥xxxij. M.

If this be intended for the extemporaneous preparation of camphor julep we think the myrrh should be omitted. We are not aware for what purpose it is added.

The same correspondent enquires, "What are the medicinal properties of oleum succini ?" It is stimulant and antispasmodic.

"T. P. D." enquires, which is the best formula for making Citrate of Iron into pills, and in what cases it is administered ? We have seen it ordered in prescriptions with extract of chamomiles, which forms a good mass. Conserve of hips is also a good vehicle, with a little liquorice powder if too soft. We are not aware that the medicinal effect of the citrate differs materially from that of other preparations of iron, but its appearance, and the absence of any unpleasant taste, recommend it to patients whose stomachs are delicate.

"D. B. an Associate." We have not seen any published formula for "Linimentum Hydrargri Nitratis," but have frequently met with prescriptions in which the ointment is ordered to be diluted with olive oil, oil of turpentine, &c.

"Omega" cannot understand how the presence of nitrate of soda in the chloride of sodium of commerce should occasion the liberation of free chlorine in the preparation of hydrochloric acid, as noticed by Dr. Christison. The nitrate of soda gives up its nitric acid, the base combining with sulphuric acid—the nitric acid, in contact with hydrochloric acid, parts with one atom of its oxygen, which combines with the hydrogen of the hydrochloric acid, giving rise to the formation of nitrous acid, chlorine, and water, $NO_5 + H.Cl.$ being converted into $NO_4 + Cl. + HO$. Thus, if colourless nitric and hydrochloric acids be mixed, they assume a deep yellow colour, and afford the smell of chlorine and nitrous acid. This is *aqua regia*, sometimes improperly called nitro-muriatic acid, which the above formula represents.

"S. C. Tite." The elementary body alluded to is Lantanium, discovered by Mosander in minerals containing cerium. It has not been much examined, and is not even noticed by Graham in his Elements of Chemistry.

"An Associate." Tables containing the "French weights and measures, with the corresponding English weights and measures," are given in Thomson's and Christison's Dispensatories, and most works of that kind. In Christison's Dispensatory also are described the "antidotes for common poisons," in treating of the different poisonous substances.

Mr. Setchfield (Leicester) adverts to the incompatibility of disulphate of quina with compound infusion of orange-peel, stating that in a mixture containing 40 grains, he had added 120 drops of diluted sulphuric acid without being able to effect its solution ; he considers water or camphor mixture preferable to any astringent infusions as a vehicle for quinine.

"T. R. A. P. S." 1. Adulteration of Copaiva. Hydrate of lime or carbonate of magnesia afford the best tests of the genuineness of copaiva. The action of the former is described at page 655, vol. i. of this Journal. Pure copaiva dissolves one-fourth of its weight of carbonate of magnesia, and remains translucent ; should any fixed oil be mixed with it, it will become opaque. The presence of turpentine may be detected by the smell, especially on applying a gentle heat.

2. See Vol. II., No. II., p. 69.

3. The usual method of bleaching castor oil is exposure to the rays of the sun.

"A Member" (Chatham), is referred to the following five answers which are applicable to his suggestion.

"R. N. A. P. S." Lindley's Flora Medica (price 18s.) is the work alluded to, which was recommended by Dr. Thomson as well as the Elements.

"X. Y. Z." Our Dispensatories contain most of the information included under the head Pharmaceutical Chemistry. A new edition of Thomson's Dispensatory will shortly be published.

"A Country Associate." Lindley's Elements of Botany (10s. 6d.) Turner's Chemistry (25s.) and Christison's Dispensatory (18s.) are adapted for the use of students, and are less expensive than some others.

"A Young Associate." Brande's Manual of Chemistry (price £1 15*s.*) is one of the most "useful works for an operative Chemist."

C. P. E. Lindley's Elements of Botany is published by Taylor and Walton. The price is 10*s.* 6*d.*

A candidate who is rejected cannot present himself again for six months, and the minor examination will be calculated to prepare the student for the major, and thus to diminish the chance of failure. Those who have been examined in classical education at the time of their apprenticeship, will not be required to undergo the same ordeal when examined as Associates, but will be expected to translate Prescriptions and the Pharmacopœia.

"A Newcastle Associate" is referred to No. VI., page 264.

"A Member from the First" informs us, that several Chemists, whom he has urged to become members of the Pharmaceutical Society, have refused, because they have heard "that the diploma, although finished, would not be issued until next year's subscription should have been paid," and wishes to be informed what are the intentions of the Council on the subject. The Council will issue the diploma *as soon as possible.* The delay has been unavoidable, and the cause of it will be satisfactorily explained in due time. Our correspondent enquires, Whether a written or engraved certificate will be given to Associates who are examined? We believe the latter: this, however, will be officially announced.

"J. E. C.," "T. A. Barber," "Several Associates," "D. D. A. P. S.," "An Apprentice," "S. M. A. P. S." "W. B." We repeat, that all *Apprentices* and *Associates*, who joined the Society prior to July 1st, 1842, are (as well as *members*) exempted from *compulsory* examination, and may, at any future time, when they commence business on their own account, become members on payment of the regular subscription (Pecoe Adams), provided they have continued up to that period their connection with the Society (W); but they cannot be admitted as members until they have commenced business, except in the case of confidential superintendents, who must be elected by the Council by ballot.—"A. B A. P. S." Although the observation in our last number, page 60, line 22, may, at first sight, appear equivocal, it is substantially correct. The case of Associates who joined the Society before July 1st, *is otherwise provided for by the law which exempts them from examination*, and the exception alluded to, with reference to an entrance fee, does not apply to new *Associates*, therefore it is inapplicable to Associates *in any instance.* The original regulation states, that after the 1st of July no person can be admitted without examination. The exception was made in order to give the Council the power of admitting, under circumstances which might appear to demand it, on payment of a fee, old established Chemists, to whom an examination would be a hardship.

"An Associate (*Derby*)," is referred to the above answer, and also to Vol. I., page 637.

"Justitia" expresses dissatisfaction at some of the proceedings in the Society, but his letter is not sufficiently explicit for publication. We wish

to encourage a candid expression of opinion in all matters in which the welfare of the Society is concerned, as it generally happens (as in the present case), that a mutual explanation is all that is required. "JUSTITIA" is referred to the following pages in the Journal, which contain answers to his chief objections: No. VII. p. 357; No. X. p. 510; No. XI. p. 563-4; No. XII. p. 634-643. If "JUSTITIA" will call on the Editor, further explanation will be given on several points on which he has evidently been misinformed.

"A STOCKPORT DRUGGIST," in allusion to the subscription, observes, "it is of the highest importance, that in the financial regulations that are made, these should be as free from objection as the most mature deliberation could anticipate, and though ample enough for the exigencies of the object, should be yet placed upon a footing as *economical* as would be commensurate with the capabilities of those whose means constitute its support." This sentence expresses precisely the sentiments of the Council and the policy on which they have acted. But our correspondent thinks "the Society is aiming at too much at once," and that the amount of subscription should be regulated not by the ulterior advantages which we hope to secure, but by the amount of *present* and positive benefit enjoyed by each individual member. We must observe, in reply, that whatever is worth doing is worth doing well, and a Society based on sound broad principles, and complete in its system and details, is more likely to receive permanent support and the protection of Government, than an Institution in which prospective benefit has been sacrificed to present economy. It is unnecessary to repeat the calculations from which it appears that a smaller subscription would be inadequate, we therefore refer to the report of the Council, Vol. I. p. 633. The Editor regrets the circumstance which gave rise to the remarks at the end of the letter.

"A MEMBER" (Ramsgate) has favoured us with some remarks on the economy of prescribing, with reference to the comparative expense of draughts, mixtures, and drops, observing that the circumstances of the patient should always be taken into consideration by the prescribers. Although we admit the justice of the remark, we think it is the prerogative of medical men to use their own discretion in the matter. Our correspondent also alludes to a case in which a druggist is *said* to have charged only 8*d.* for a ℥x gargle. In such cases it is always better to make enquiry of the party so accused, as it is a common practice to make these assertions for the sake of obtaining medicine at a lower rate. We have known many cases in which a bad feeling has sprung up between druggists from this cause, which has been entirely removed on a mutual explanation taking place, it being discovered that each party had been falsely accused to the other of making the reduction which the customer hoped by this means to gain from both.

"S." (Liverpool) has favoured us with a communication, the object of which is to recommend the closing of shops and cessation of business at seven o'clock instead of eight! The first thing to be done is to persuade the public to discontinue "the habit of purchasing drugs at the time they ought to be going to bed." The next step is by increased exertion to complete by seven o'clock all the orders which come in during the day, and to rise an hour earlier in the morning for this purpose! We have no room to publish the letter, which contains a variety of reasons in favour of seven o'clock. Our Associates in London who are generally at work till eleven, would naturally exclaim, on hearing the argument between *seven* and *eight*, "How happy could I be with either!"

Advertisements to be addressed to Mr. CHURCHILL.

Other Communications to the EDITOR, 338, Oxford Street (before the 20th of the month, if answers be desired in the ensuing number).

PHARMACEUTICAL JOURNAL.

VOL. II.—No. IV.—OCTOBER 1st, 1842.

THE CERTIFICATE OF MEMBERSHIP.

In order to explain in a more complete and satisfactory manner than has hitherto been done, the object and value of the certificate or diploma which is designed for the Members of the Pharmaceutical Society, we propose to advert to the circumstances which led to its adoption, and to add a few general remarks on testimonials of this description.

The dread of probable injury which, in the first instance, brought the Members of the Society together, was a feeling which from its nature was not likely to be permanent in its duration, or productive of any result beyond the excitement of the moment. The cause being removed, the effect must inevitably cease, and the more complete the success of the measures adopted, the more speedy would be in any case of this kind, the dispersion of the forces, and the termination of the campaign.

But in the establishment of the Pharmaceutical Society, ulterior objects were contemplated, and motives of a more substantial character than the ephemeral excitement of a casual panic, were brought into the field. The causes of our dilemma having been traced to the anomalous position of our body, and the absence of any standard round which we could rally in the event of our professional character being called in question, it was obvious that the most effectual remedy, and in fact the only one which could secure us against future contingencies, would be the permanent union of ourselves into an Association, which might ultimately comprise within its ranks all the properly qualified Chemists and Druggists in the kingdom.

This undertaking was one which must of necessity be a work of time. It was clear that *all* our brethren would not simultaneously entertain precisely the same views, especially as a large proportion of them could not from their position or locality be conversant with the facts of the case, and yet it was desirable to extend the field of our labours far and wide, and to enlist in the work at all events the leading members of the trade throughout the country. In order to attain this end, it was necessary to circulate information in all quarters as to the importance of taking some decisive steps, and also to show that the plan projected was calculated to avert any evils that might be apprehended,

and to secure directly or indirectly an amount of advantage at least equivalent to the exertions and expense incurred.

Whatever might have been the motives which influenced the early supporters of the Society, we hope and believe that the most prominent was a desire to belong to an association designed to effect the organization and improvement of its members and to aid in raising the standard and character of the profession. This inducement, we presume, all our readers will agree in considering substantial and commendable. But while the consciousness of participating in the achievement of a laudable design, operated to a certain extent as a stimulus, the anxiety to enjoy a share of the *credit*, was a feeling so natural as to be almost inseparable from the human mind on such an occasion, and it was frequently suggested that some means should be devised by which the promoters of the Society, those who had come forward for the purpose of upholding the credit of their profession, might be distinguished from the indifferent as well as from the ignorant. It was objected that the printed receipt for the subscription was too insignificant a document, and that a certificate should be given to members, which would be more in accordance with the respectability of the Society.

In consequence of a very general expression of these sentiments, which appeared by no means unreasonable, a design was prepared, consisting of a wreath of medical plants, in the centre of which it was proposed to engrave the form of certificate. This however, when submitted to the Council, was rejected as being unlikely to give general satisfaction, and Mr. Briggs, R.A. having been consulted on the subject, he offered to make a drawing, which he liberally presented to the Society. The design was unanimously adopted, an eminent engraver was commissioned to execute the plate, and for the early information of the members, a miniature etching was inserted in the Journal.

From the numerous communications which we have received on the subject, we may conclude that the design has been generally approved, as the chief complaint which we have received has had reference to the (*unavoidable*) delay in the distribution of the diploma. But a few correspondents have raised an objection to the issuing of any diploma whatever to the original members of the Society, on the ground of their having been admitted without examination. It is granted on all hands that some credit is due to those who, in a case like the present, have united their endeavours and conferred a benefit on the public by introducing a reformed system into their profession, and it cannot be denied that some documentary evidence of the fact may fairly and reasonably be claimed by the parties concerned. But it has been objected that a diploma (in the ordinary sense of the term) indi-

cates proficiency in some pursuit, and consequently implies that the possessor has passed an examination. Admission having been obtained by purchase in the case of our original members, the granting of the certificate to them has been said to be a violation of the principle on which the Society was formed.

We shall endeavour to point out the fallacy of this notion.

The form of words, which constitutes the certificate, states, that A—— B—— is a Member of the PHARMACEUTICAL SOCIETY OF GREAT BRITAIN.

This implies that A.B. is a regularly educated Chemist and Druggist—not that he has been regularly educated by the improved system which the Society is establishing, but that he is, *according to the law of the land* and *our definition*, a Chemist and Druggist; and that he has contributed towards the advancement of his profession by joining the Society, which without such support at its outset could not have existed.

Some of our correspondents have imagined that admission was granted to all persons who tendered the subscription, without any reference to qualification. This is a mistake. Many subscriptions have been refused because the parties were found not to come within our definition, and in every case which has been reported to the Council of parties having been improperly admitted, the subscription has been returned. We are, therefore, bound to believe, in the absence of any information to the contrary, that every member on our present list is, as his certificate implies, qualified for admission into the PHARMACEUTICAL SOCIETY.

There is one fact which some of our friends appear entirely to have forgotten, namely, that "Rome was not built in a day." One of the leading maxims of our Society is, that every person who is engaged in preparing and dispensing medicines ought to pass an examination, and we look forward to the establishment of this custom as the *ultimate* result of our labours. But before we could commence the examinations it was necessary to appoint examiners. This could only be done by a council or board invested with authority from *a large portion of the trade;* and, in order to carry the measure into effect, an establishment furnished with all the requisite machinery was indispensable. If we had attempted to subject all the present race of Chemists to examination, we should have failed in our object altogether. Even the law could not in such a case assume retrospective power; and, although we might, it is true, have adopted any regulations or restrictions we thought proper as to the admission of members into our Society, the result would have been, not that all our brethren would have submitted to our terms, and passed the examination, but that our list, instead of comprising

1645 Members and 2297 Associates, might have contained the names of forty or fifty. On this contracted scale the failure of our undertaking would have been inevitable, and we might attribute our want of success to the endeavour to realize at once what ought to have been the work of years—in other words, to "build Rome in a day."

The PHARMACEUTICAL SOCIETY is not established for the year 1842 or 1843, but it is intended to effect that *gradual* improvement in our position and standard of qualification, which could not by any power, legislative or otherwise, be brought about by a sudden revolution. In the course of ten years, we may anticipate that many of our present members will have given place to others,* who will have been regularly examined; those original members still remaining on the list will have had an additional ten years of experience in their business, and having stood the test of public opinion for that period, may be considered to have passed an examination. In each succeeding year the evil complained of will diminish, while the total amount of qualification in our body will increase, until at last—

"By seeming wise, we grow to what we seem."

In all new societies the regulations must be adapted to existing circumstances, and to the state and condition of the class for whom such societies are instituted.

In the year 1511, it was provided by act of parliament, "That no person, within the city of London, nor within seven miles of the same, take upon him to exercise and occupy as a Physician, except he be first examined, approved, and admitted, by the Bishop of London, or the Dean of St. Paul's." This was the first examination instituted for Physicians, and, in a medical point of view, it must be acknowledged, that it possessed no value whatever; yet those who passed this examination, were admitted to an enjoyment of all the privileges of Physicians, and the principle of examination having been by this means recognised, the regulations under which it was conducted, were subsequently modified and gradually brought to their present degree of perfection. We may, therefore, trace the system of education and examination adopted by the college to a very obscure and imperfect origin.

In adopting measures for organizing and improving a class of men, it would be unwise and unjust to exclude all the present

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* It is worthy of remark, that of the long list of subscribers to the fund raised in 1814 and 1815, so many have been removed by death and other causes, that when a meeting was called in November, 1841, for the purpose of proposing the transfer of the balance to the PHARMACEUTICAL SOCIETY, the number remaining on the list did not amount to seventy.

race, or a majority of them, on the ground that they are not as near perfection as it is desirable to make them; for had they been *perfect*, no reform or alteration would have been required. Moreover, the Founders of the Society being both judge and jury in their own case, it would have been unbecoming in them to deny their brethren that privilege which they had claimed for themselves, and which was their undoubted right.

If then we take for granted that our original members are so far qualified as to be entitled to admission without examination, we could not refuse to grant them certificates of membership. By such a refusal, we should give to young men commencing business, an ostensible superiority over their late employers; for although the latter might possess the greater amount of qualification, in addition to long experience, they might not think proper to go to school again, and learn their rudiments a second time, for the sake of passing an examination, after having been fifteen or twenty years in business. Our extensive correspondence during the last twelve months, on behalf of the Society, enables us to state with confidence the opinion, that, had this regulation been adopted, our list of Members would have been very small indeed.

Although the Associates on our present list do not receive the diploma, they will be entitled to it without examination when they commence business and become Members. Those who are desirous of possessing a certificate in the mean time can obtain one by passing the minor examination.

It would be a hardship to a man advanced in years to submit to be examined (probably by his juniors); but this does not apply to young men who are entering on their profession, and who therefore ought to be encouraged to distinguish themselves.

For this reason, the objection to which our anti-diploma correspondents have drawn our attention, cannot be urged with reference to Associates; but other correspondents find fault with the arrangement on this account, and write long letters to prove that every Associate and Apprentice, who pays a guinea, ought to have a diploma. This places us exactly in the predicament of the old man and his ass, in Æsop's fables.

Some of the communications which we have received on this subject allude to the case of those Associates who have little or no prospect of commencing business on their own account, and who, it is contended, should be allowed to pass the major examination, and receive the diploma. We have only to observe, in reply, that the by-laws of the Society are as yet incomplete, and, we trust, that experience will in due time enable us to provide for all those cases which are, in fact, the exceptions to general rules.

LECTURE

ON THE ELEMENTARY COMPOSITION OF FOODS

CONSIDERED IN REFERENCE TO THEIR NUTRITIVE QUALITIES.

BY JONATHAN PEREIRA, M.D., F.R.S. AND L.S.,
Assistant Physician to the London Hospital, and Examiner in Materia Medica and Pharmacy to the University of London.

[*Concluded from our last Number.*]

I PROPOSE now to state briefly those circumstances which have been adduced in favour of the opinion, that nitrogenised foods alone nourish the tissues, offering, as I proceed, short commentaries on them.

1. The first argument is, that *as the animal tissues contain nitrogen as one of their essential constituents, and as this element cannot be created in the system, it must be derived from either the food or the atmosphere; but as it is not absorbed from the atmosphere in the vital process, it must be obtained from the food.*

It appears to me, that if it can be demonstrated that "no nitrogen is absorbed from the atmosphere," the most important fact in favour of the theory of nitrogenised food, is obtained. But has this been done? I think not. Numerous researches have been undertaken by different persons to determine this point, but the results have been most discordant. Some of the experimenters have declared that the nitrogen of the air is passive in respiration; some have asserted that nitrogen is generated in the lungs; some that it is absorbed; others that it is both absorbed and exhaled—under certain circumstances absorption being most active, under others exhalation. What conclusions, then, it may be asked, have cautious, unbiassed, and well-informed Physiologists drawn from these discrepant assertions. Let us see what Müller, one of Liebig's countrymen, and the most distinguished physiologist of the age, says on this subject. "The conclusion to be deduced from all these experiments seems to be, that during respiration nitrogen is both absorbed and exhaled by the blood" (I quote from Dr. Baly's translation). Dr. Bostock, also, the author of an excellent system of physiology, observes that "it appears probable that nitrogen is both absorbed by the lungs and exhaled from them." Is it not most remarkable, therefore, that Liebig should assert that "no nitrogen is absorbed from the atmosphere," without assigning his reasons for making that assertion, the more especially as it is in opposition to the experiments of such men as Priestley, Davy, Cuvier, Pfaff, Henderson, Spallanzani, Edwards, and others, and to the generally received opinions of Physiologists? It appears to me to be completely begging the question. The establishment or rejection of the theory of nitrogenised foods is most essentially

affected by the present argument; for should it be shown that nitrogen is absorbed by the lungs, we have then another source for the nitrogen of the tissues; while, on the other hand, if nitrogen be not absorbed, the tissues can only obtain this element from the food.

But there is another source of nitrogen which has not been hitherto noticed, I mean the ammonia of the atmosphere. Liebig has demonstrated the existence of this substance in the air, and has assigned strong reasons for believing that plants derive the nitrogen of their nitrogenised principles from it. The ammonia of the inspired air may, therefore, be one of the sources from whence animals derive a part, small though it be, of the nitrogen of their system.

In conclusion then I may observe, that it appears to be highly desirable to ascertain how far a diet of exclusively nitrogenised or of non-nitrogenised food, would affect the quantity of nitrogen expired. Despretz asserts, that the exhalation of nitrogen is greater in the herbivora than in the carnivora, a circumstance we were scarcely prepared to expect.

2. *The second argument is, that non-nitrogenised foods alone are incapable of supporting animal life.*

It has been found, by experiments on animals, that gum, sugar, starch, or butter cannot alone preserve the health and life of animals. Magendie* found that dogs fed exclusively on sugar and water died in from thirty-one to thirty-four days; and similar results were obtained with butter and with gum. Tiedemann and Gmelin † have confirmed Magendie's statements. They found that geese fed on sugar and water, or gum and water, or starch and water, died in from sixteen to twenty-four days.

Magendie also states, in confirmation of the above, that in 1793 five sailors, on board the wreck of a vessel from Hamburgh, had subsisted for nine days on sugar and a small quantity of rum, and that they were found by a French vessel in a most debilitated state (the youngest excepted). The three oldest died shortly afterwards. He further adds, that an eccentric individual in Paris had subsisted for nearly a month on potatoes ‡ and water. At the end of this time he was extremely feeble, and passed an extraordinary quantity of urine; but by the use of nitrogenised food he recovered in a few weeks. Sir Christopher Wren § also states, "that it was of late years found, that the blacks, who feed only on potatoes, were apt to die of the dropsy; and, therefore, the planters had found it necessary to allow them milk and bread, which prevented it." And he further observes, "that in

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* *Ann. de Chim. et de Physique*, t. iii., p. 66, 1816.

† Quoted by Müller.

‡ Ten thousand parts of potatoes contain, according to Boussingault, only thirty-seven parts of nitrogen.

§ Birch's *History of the Royal Society of London*, vol. iv. p. 93.

Ireland, where the people feed much on potatoes, they help themselves by drinking milk soured, to make the potatoes digest the better."

But as a drawback to the value of the preceding statements, it is necessary to state that a diet of one nitrogenised principle exclusively is incapable of supporting animal life. Fibrine, albumen, or gelatine, taken separately, does not support life: even the artificial mixture of these principles, is insufficient to preserve life—for dogs thus fed, ultimately died with all the signs of complete inanition. While, on the other hand, a diet of muscular flesh, or of raw bones, or of gluten exclusively, is capable of complete and prolonged nutrition.*

It has been said, however, that both gum and sugar are capable of supporting human existence. The asserted power of gum to support life rests principally on a story, told by Hasselquist†, of a caravan of more than one thousand persons, travelling from Abyssinia to Cairo, and whose provision being exhausted, supported themselves for two months on the gum they were carrying as merchandize. But there are no details given to satisfy us of the accuracy of the conclusion which has been drawn from it. Altogether the case is not one to be relied one. Of the use of gum by the Moors, Negroes, and Hottentots, we have but little detailed and undoubted information.

The evidence of the nutritive property of sugar applies principally to the use of this substance in an impure state, in which it contains nitrogenous matter‡. But my friend, Mr. Porrett, has informed me of the case of a lady, who was nourished for several years on refined sugar.§

3. The third argument is, that *the food of all animals, herbivorous and carniverous, contains nitrogenised matters, identical in composition with the principal constituents of the blood and*

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* See the *Report of the Gelatine Committee*, in the *Comptes Rendu des Seances de l'Académie des Sciences*, No. V. Août, 1841.

† *Voyages and Travels in the Levant*, p. 298. Lond., 1766.

‡ An amusing illustration of this has been furnished by Liebig, with respect to the saccharine juice of Maple trees, which he found to emit so much ammonia when mixed with lime, that suspicion was at first excited that some malicious wag had introduced urine into it; and, accordingly, the vessels, which hung upon the trees in order to collect the juice, were watched with great attention.

§ I have received from Mr. Porrett the following letter on the subject:—

Tower, 5th August, 1842.

My dear Dr. Pereira,—I regret much my inability to give you any particular details of the very singular case I mentioned to you—that of a woman, whose sole nourishment for several years was refined lump sugar.

By comparing circumstances together, I find that at least thirty years must have elapsed since the case was mentioned to me, and the following is all I can recollect about it:

My informant was a Mr. Syms, a young surgeon, since dead. His father was the medical practitioner at that time of the village of Colyton, in Devon-

organised tissues of the animal body; and, therefore, the carbon of gum, sugar, and starch, and the carbon and hydrogen of the fats and oils are not required for the production of blood.

One of the most surprising facts for which we are indebted to the school of Giessen is, that vegetables contain organic principles identical in composition with animal fibrine, albumen, and caseine. "They are not merely similar," observes Liebig, "but absolutely identical, not only in having the same proportion of carbon, hydrogen, oxygen, and nitrogen, which the animal principles contain, but also in possessing the same relative amount of sulphur, phosphorus, and phosphate of lime."

Fibrine, albumen, and caseine, both animal and vegetable, dissolve in a solution of caustic potash. If to the resulting liquid acetic acid be added, the same precipitate is obtained whichever of the above three principles has been employed. The substance thus precipitated has been called, by its discoverer, Mulder, *proteine* (from *πρωτεύω—I hold the first place*). Its formula is $C_{48}\ H_{36}\ N_6\ O_{14}$. Fibrine, albumen, and caseine are compounds of it, and sulphur, and, in the case of the two first of these bodies, of phosphorus.

ANIMAL.		VEGETABLE.	
Fibrine . .	=*Proteine*+S +Ph.	Fibrine . .	=*Proteine*+S +Ph.
Albumen .	=*Proteine*+S^2+Ph.	Albumen .	=*Proteine*+S^2+Ph.
Caseine . .	=*Proteine*+S	Caseine . .	=*Proteine*+S

"Vegetable fibrine and animal fibrine, vegetable albumen and animal albumen, hardly differ," says Liebig, "even in form; if these principles be wanting in the food, the nutrition of the animal is arrested; and when they are present, the graminivorous animal obtains in its food the very same principles, on the presence of which the nutrition of the carnivora entirely depends."

4. The fourth argument is, that *the quantity of nitrogenised food, which herbivorous animals consume, is amply sufficient for the growth and development of their organs, and for the supply of waste.*

We are indebted to Boussingault* for the demonstration of the truth of this statement, in the case of the cow and the horse. The following table is taken from his memoir: the numbers represent French grammes. [1 gramme=15.434 grs. troy.]

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shire, and the case was that of a friend or patient of his, residing in or near to Colyton.

The lady in question had refused to take *any other nourishment whatever during several years than lump sugar*, of which she consumed about half-a-pound per day, notwithstanding which she appeared healthy, and had a good colour in her cheeks; but she was confined to her bed, being too weak to walk about. I do not know whether her age was mentioned to me or not, but the impression on my mind is, that she was above the middle age.

I am in hopes by reference to friends on the spot, to gain more intelligence respecting this case, and if successful, I shall be happy to make you acquainted with further particulars.

I remain my dear Sir, yours, faithfully, R. PORRETT.

* *Ann. de Chem. et de Physique*, t. lxxi.

FOOD CONSUMED BY, AND EXCRETIONS OF, A HORSE IN TWENTY-FOUR HOURS.

FOOD CONSUMED BY A HORSE IN TWENTY-FOUR HOURS.								EXCRETIONS OF A HORSE IN TWENTY-FOUR HOURS.							
ARTICLES OF FOOD.	Weight in Fresh State.	Weight in Dry State.	Carbon.	Hydrogen.	Nitrogen.	Oxygen.	Salts and Earthy Matters	EXCRETIONS.	Weight in Fresh State.	Weight in Dry State.	Carbon.	Hydrogen.	Nitrogen.	Oxygen.	Salts and Earthy Matters
Hay . . .	7500	6465	2961.0	323.2	97.0	2502.0	581.8	Urine . .	1330	302	108.7	11.5	37.8	34.1	109.9
Oats . . .	2270	1927	977.0	123.3	42.4	707.2	77.1	Excrements	14250	3525	1364.4	179.8	77.6	1328.9	574.6
Water . .	16000	..	..	..	..	..	13.3								
Total . .	25770	8392	3938.0	446.5	139.4	3209.2	672.2	Total . .	15580	3827	1472.9	191.3	115.4	1363.0	684.5
Deduct Excretions	15580	3827	1472.9	191.3	115.4	1363.0	684.5								
Excess of Food .	10190	4565	2465.1	255.2	24.0	1846.2	*minus* 12.3								

Now it appears from this table, that after deducting the nitrogen of the urine and excrements from that contained in the food, the surplus quantity is 24 grammes (370$\frac{416}{1000}$grs. troy); and if we assume that ordinary blood contains 80 per cent. of water, and that the dry residue (20 per cent) contains 15.07 per cent. of nitrogen, it follows that 370$\frac{416}{1000}$grs. troy of nitrogen are sufficient to form 2457$\frac{9694}{10000}$grs. troy of dried blood, or, 12289$\frac{847}{1000}$grs. troy (equal to 1lb. 12ozs. 40grs. avoirdupois) of ordinary blood, in other words about 1$\frac{3}{4}$lb. avoirdupois of blood may be formed daily from the above quantity of food.

Moreover, 100 parts of dried blood contain 51.96 of carbon, and, therefore, 2457$\frac{9694}{10000}$grs. troy, contain about 1273grs. troy, of carbon. If, therefore, we abstract the latter quantity from 38046$\frac{3534}{10000}$grs. troy (=2465.1 grammes) the residual carbon in Boussingault's table, we have 367733$\frac{3535}{10000}$grs. troy (5lbs. 4ozs. 23grs. avoirdupois) of carbon to be thrown out of the system by the lungs and skin in the form of carbonic acid. Now Boussingault calculates that a horse expires daily 28078grs. troy (about 4lbs. avoirdupois) of carbon.

Such are the principal arguments which I have been able to collect in favour of the theory of nitrogenised foods. I shall not stop to discuss this theory, or to point out its defects until I have explained to you the uses which Liebig assigns to non-nitrogenised foods.

It cannot be a matter of doubt that non-nitrogenised substances are intended by nature to constitute part of the food of man and other animals, but especially of the herbivora. We find fixed oil in the yolk of the egg, and in milk (in which it is called butter), two substances supplied by nature for the food of young animals. Milk contains a second non-nitrogenised alimentary principle, namely sugar. If we further add the fondness of animals for non-nitrogenised substances, the craving, nay, almost insatiable desire for them, manifested by individuals who are deprived of them, and the fact before mentioned, that nitrogenised food alone cannot support life, not a doubt can remain in our minds that these principles are essential to health and life.

In commencing our enquiry then into the particular purpose they serve in the animal economy, I would observe, in the first place, that with the exception of fat, none of them are constituents of the animal system; nor in a state of health are they found in the excretions. It is obvious, therefore, that they must suffer some change or transformation in the organism. Now they all consist of carbon, hydrogen, and oxygen. In starch, sugar, and gum, the hydrogen and oxygen are exactly in the ratio to form water. Do they, therefore, contribute carbon, or in

some cases, carbon and hydrogen, to assist in the formation of blood? Liebig asserts they do not, for he observes that as the nitrogenised principles used as food contain exactly the "amount of carbon [and hydrogen] which is required for the production of fibrine and albumen," it follows that the carbon of gum, sugar and starch, and the carbon and hydrogen of butter and other fats cannot "be employed in the production of blood." If the nitrogenised principles contained less carbon than albumen and fibrine, then starch, sugar, gum, and fat, might give up some carbon to compensate the difference. He, therefore, concludes, that these bodies yield their carbon, and, when their hydrogen is in excess to their oxygen, part of their hydrogen also, to form with atmospheric oxygen, carbonic acid and water, and, therefore, to develope heat. They serve to protect the organism from the action of the oxygen, which, in the absence of food, consumes the tissues. "If," says Liebig, "we observe a man or other animal in sickness, or at any time when the body is not supplied with nourishment to compensate for the continual loss, we find him to become lean; the fat is the first to disappear, it vanishes through the skin and lungs in the form of carbonic acid and water, as none of it can be found in the fæces or urine; it resists the action of the atmosphere on the body, and is a protection to the organs. But the action of the atmosphere does not end with the loss of fat; every soluble substance of the body enters into combination with the oxygen of the air. The influence of the oxygen of the atmosphere is the cause of death in most chronic diseases, from want of carbon to resist its action, that of the nerves and brain is used. In a normal state of health and nutrition, the carbon of the carbonic acid must have another source."

You will now understand why Liebig calls the non-nitrogenised foods *elements of respiration;* and will comprehend in what way *alcohol* taken dietically contributes to the production of animal heat. The *Temperance* and *Tea-total Societies* have quite overlooked this use of spirit. It certainly cannot alone form organised tissues, since it is deficient in some of the essential ingredients—nitrogen, sulphur, and phosphorus. But it cannot be doubted that it undergoes some change in the animal economy, and probably may be made some use of. It is not found in the excretions; traces of it, indeed, are recognisable in the breath, but the quantity in this way thrown out of the system is inconsiderable, and scarcely worthy of consideration. It, therefore, must be got rid of in the form of carbonic acid and water, and to convert it into these substances it requires merely atmospheric oxygen.

Alcohol . .	C_4	H_6	O_2		Carbonic acid .	C_4	—	O_8
Oxygen . .	—	—	O_{12}		Water . . .	—	H_6	O_6
	C_4	H_6	O_{14}			C_4	H_6	O_{14}

Now, the formation of carbonic acid and water must be attended with the development of heat; and, therefore, alcohol is a fuel in the animal economy, by the combustion of which, caloric is evolved. Common experience favours this view. Coachmen and others take it in cold weather to keep them warm, and it is familiarly used to prevent what is commonly called "catching cold." In cases of extreme suffering and exhaustion from excessive exertion and privation of food, the cautious and moderate dietetical use of spirit has, on many occasions, proved invaluable. In Captain Bligh's account* of the sufferings of himself and companions, in consequence of the mutiny of the crew of the Bounty, he observes, "The little rum we had was of great service: when our nights were particularly distressing, I generally served a teaspoonful or two to each person: and it was joyful tidings when they heard of my intentions." It is said, that the inhabitants of colder climates take more spirit than others and with less injury. Liebig accounts for this by saying that they inhale a more condensed air, that is, they take in more oxygen at every inspiration; combustion is more rapid in them, and thus the elements of the alcohol are more speedily got rid of.†

I trust that in offering these remarks on the effects of alcohol, I may not be misunderstood. I do not wish to cast any reflections on the Societies before referred to, whose motives I highly esteem, and whose objects I would gladly promote. It is my duty, however, to lay before you, on this matter, what I believe to be the truth. If I had to point out the injurious qualities of alcohol, I think I could soon prove that though it evolves heat in burning, it is an obnoxious and most expensive fuel. Consider its volatility, the facility with which it permeates membranes and tissues, and its injurious operation, before it is burnt in the lungs, on the stomach, the brain, and the liver.‡ Remember that though spirit burns and evolves heat, there are, under ordinary circumstances, other better, safer, and cheaper combustibles to be burned in the vital lamp.

Some of these non-nitrogenised foods serve another purpose in the

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* *Voyage to the South Seas* in 1787-9, p. 190. Lond. 1792.

† The Highlanders, who it is well known are immoderate drinkers, pretend that spirit does not intoxicate in the Hills as it would do in the Low Country. (See *Letters from a Gentleman in the North of Scotland to his friend in London*, vol. 2, p. 161, 5th Ed., Lond. 1818).

‡ The effect of alcohol on the stomach may be ascribed to its topical chemical action. But in connection with its well known action on the brain, and its tendency to produce granulated liver (the *drunkard's* or *gin liver*), it deserves to be noticed, that alcohol has been detected in the brain and liver of those who have died under its influence. (See Pereira's *Elements of Materia Medica*, vol. 1, p. 359, 2d edit.)

animal economy—*they contribute to the formation of fat.* When the quantity of these foods taken into the stomach is great, that is, out of proportion to the quantity of oxygen absorbed by the lungs, fat is, under some circumstances, formed. Sugar, starch, and gum become, by the loss of part of their oxygen, fat; for the relative proportion of their carbon and hydrogen is almost identical with that of fat.

Starch contains .	79	carbon	to	10.99 hydrogen.
Sugar . .	79	—	"	11.80 —
Gum . .	79	—	"	11.80 —
Mutton fat .	79	—	"	11.1 —
Human fat . .	79	—	"	11.4 —
Hog's lard . .	79	—	"	11.7 —

Some facts adduced by Liebig are almost conclusive that starch and sugar may become converted into fat in the animal economy. A lean goose, weighing 4lbs. gained, in thirty-six days, during which it was fed with 24lbs. of maize, 5lbs in weight, and yielded 3½lbs. of fat. Now this fat could not have been contained in the food ready formed, because maize does not contain the thousandth part of its weight of fat, or of any substances resembling fat. A certain number of bees, the weight of which were exactly known, were fed with pure honey devoid of wax. They yielded one part of wax for every twenty parts of honey consumed, without any change being perceptible in their health or in their weight. I agree with Liebig, that with these facts before us, "it is impossible any longer to entertain doubt as to the formation of fat from sugar in the animal body*."

But alcohol is an element of respiration. Does it form fat? I think not. In the first place, its carbon and hydrogen are not in the ratio of those of fat, for it contains 79 parts of carbon to 19.74 of hydrogen. Secondly, we do not find that spirit drinkers are fat; but, on the contrary, emaciated. Hogarth, in his *Beer Alley* and *Gin Lane*, has ludicrously though faithfully represented the differences in the appearance of beer topers and spirit tipplers. The first are plump, rubicund, and bloated; the latter are pale, tottering, emaciated, and miserable.

Nutritive equivalents. Several writers have endeavoured to form a scale of nutritive equivalents, the value of which, if

* The mode of promoting obesity, practised in certain parts of the world, lends support to the above statements. If "we can trust to the reports of physicians who have resided in the East," says Liebig, "the Turkish women, in their diet of rice, and in the frequent use of enemata of strong soup, have united the conditions necessary for the formation both of cellular tissue and fat." M. Caullet de Vaumoral, quoted by Mrs. Walker, (*Female Beauty*, p. 171, Lond. 1837), states that in the Bey's Seraglio at Tripoli, women are fattened against a certain day by means of repose and baths, assisted by a diet of Turkish flour, mixed with honey. Fifteen days, he says, were sufficient for the purpose.

accurate, will be universally admitted. Boussingault has suggested one, founded on the quantity of nitrogen contained in foods.

SCALE OF NUTRITIVE EQUIVALENTS.

Substances.	Equivts.	Substances.	Equivts.
Wheat-flour	100	White haricots	56
Wheat	107	Lentils	57
Barley-meal	119	White garden cabbage	810
Barley	130	Ditto dried at 212°	83
Oats	117	Potatoes	613
Rye	111	Ditto kept 10 months	894
Rice	177	Ditto dried at 212°	126
Buck-wheat	108	Carrot	757
Maize, or Indian corn	138	Ditto dried at 212°	95
Horse-beans	44	Jerusalem artichoke	539
Pease	67	Turnips	1335

You will observe, that in this table 44 parts of horse-beans, or 67 of pease, are represented as being equal in nutritive power to 100 parts of wheat flour. Surely, this cannot be correct? Liebig admits, that though lentils, beans, and pease, surpass all other vegetable food in the quantity of nitrogen they contain, yet that they possess but small value as articles of nourishment, because they are deficient in the component parts of the bones (phosphate of lime and magnesia); they satisfy the appetite without increasing the strength. If this explanation be correct, it suggests to the Poor Law Commissioners, the propriety of ordering bone-ashes with either horse-beans or grey-pease, as a most nutritive and economical food for the Union-Houses!

It is well known that all nitrogenised vegetable principles are not nutritive, for the most powerful of the vegetable poisons, as the vegetable alkalies, are nitrogenised*. But Boussingault has met this objection by observing, that these violent poisons are not met with in appreciable quantity in alimentary plants;

* Liebig asserts that all the [vegetable] poisons contain nitrogen. But *anthiarin*, the active principle of the Upas poison is devoid of it. Moreover, *elaterin* is a non-nitrogenised principle. Furthermore, no ratio can be observed between the proportion of nitrogen and the physiological effect of the vegetable nitrogenised substances. Thus, *solanina* contains 1.64, picrotoxine 1.3, morphia about 5, strychnia about 8, quina 8.64, and caffeine 28.78, per cent. of nitrogen; yet solanina is a poison, caffeine not so. Lastly, the difference between the per centage composition of quina and strychnia, is too slight to admit of safe conclusions being drawn, as to the cause of the difference of operation of those two bodies.

	Quina.	Strychnia.
Carbon	74.08	76.08
Hydrogen	7.40	6.63
Nitrogen	8.64	8.07
Oxygen	9.88	9.22
	100.00	100.00

and, therefore, a vegetable substance which has been accepted as animal nourishment, may be inferred to be devoid of any hurtful principle.

But this must be received with considerable limitation. The *solanina* of potatoes, the *sulphosinapisin* of white mustard, and the *myronic acid* of black mustard are nitrogenised, though not nutritive, principles, which occur in substances used as food, and whose presence must erroneously lower the nutritive equivalent—that is, raise the estimated nutritive value of the substances in which they are respectively contained. And if we were to apply Boussingault's principle to animal substances, we should in the outset meet a difficulty, in the case of gelatine,* which contains a larger amount of nitrogen than either flesh or blood, but which, according to Liebig, is capable of nourishing the gelatinous tissues only.

But, notwithstanding these and other drawbacks to its accuracy, this mode of forming a scale of nutritive equivalents is of great interest and value, on account of the extreme difficulty of arriving at correct results by practical methods.

5. Phosphorus. This is a constituent of both animals and vegetables. It is an essential ingredient of albumen and fibrine, and of all tissues composed of those principles. Nervous matter also contains it. Its existence in the brain has been long known. In 1834, Couerbe † advanced an absurd notion, that the healthy or morbid conditions of the mental faculties were connected with variations in the amount of this substance in cerebral matter. "In the brains of sane men," says he, "I have found from 2 to 2.5 per cent. of phosphorus, in those of idiots only 1 or 1.5, while in those of madmen there are from 3 to 4.5 per cent.!" It is scarcely necessary to say, that the accuracy of this assertion has been disproved; and Lassaigne,‡ fixes the amount of phosphorus in the brains of madmen at from 1.93 to 1.97 per cent.

The bones also contain phosphorus, which exists in them in

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* The reader is referred to the *Compté Rendu des Seances de l'Académie des Sciences.* Août, 1841, for the *Report made by the Gelatine Committee.* This report is the result of ten years labour. The reporter (M. Magendie) shows that though raw bones are capable of effecting the complete and prolonged nutrition of dogs, yet that there is no process known for extracting from bones an aliment which, either alone or mixed with other substances, can be substituted for meat. He also infers that—as gelatine, albumen, or fibrine separately or artificially combined, are incapable of permanently nourishing; while flesh, which consists of gelatine, albumen, fibrine, fat, salts, &c. combined according to laws of organic nature, suffices, even in small quantity, for complete and prolonged nutrition—it is the "organic condition" which forms such an important element in this process.

† *Ann. de Chém. et de Physique*, p. 190, 1834.

‡ *Journ. de Chém. Med.* t.1er IIe Série p. 344, 1835.

combination with oxygen and lime principally, constituting a sub-phosphate of lime (*bone ash*).

As phosphorus, therefore, is an essential ingredient of the animal body, it must of course be a constituent of the food. The yolk of egg and milk, both aliments for young animals, contain it; in the latter of these foods it exists as sub-phosphate of lime. It is a constituent of the bones and flesh of animals, and of many vegetable substances on which we feed. Fruits and seeds, especially of the grasses, abound in the earthy phosphates: and horses are in consequence subject to the formation of a large intestinal concretion (*hippolithus*) composed of ammoniacal phosphate of magnesia derived from the husk of the oats on which they are fed. You see, that each of the two specimens of this concretion on the table is as large as a child's head, and weighs several pounds. Fishes are especially rich in phosphoric matter,—a fact which explains the circumstance related by Dumas,* of the evolution of phosphuretted hydrogen in the purification of spirit which had been used for preserving fish.

The following table shows the quantity of phosphorus, phosphoric acid, or earthy phosphates, contained in some alimentary substances.

TABLE OF THE QUANTITY OF PHOSPHORUS, &c., IN ALIMENTARY SUBSTANCES.

1000 Parts.	Quantity of Phosphorus.	
Fibrine (dried) . . } Albumen of eggs (dried) . }	4.3 to 3.2	Mulder.†
Albumen of serum of blood (dried)	3.3	Mulder.
Vegetable fibrine . . } ——— albumen . . }	as animal fibrine and albumen.	Liebig.
Cerebric acid (in brain) .	9	Fremy.‡
Oleophosphoric acid (in brain) .	12 to 19	Ditto.

1000 Parts.	Quantity of Phosphoric Acid.	
Potatoes (dried) . .	5.631	Einhoff.§

1000 Parts.	Quantity of Earthy Phosphates.	
Wheat . .	from 3.6 to 9	Hermbstaedt ‖
Rye . . .	6 to 41.8	
Barley	1 to 6	
Oats	1.6 to 6	
Rice	1.3 to 4	
Garlic . . .	11	

* *Traité de Chimie.* t. i.

† *Pharmaceutisches Central Blatt für* 1838, p. 885.

‡ *Journal de Pharmacie*, t. xxvii. p. 453, 1841.

§ *Thomson's Chemistry of Organic Bodies*, p. 840.

‖ *Anleitung zur chemischen Zergliederung der Vegetabilien überhaupt und der Getreidearten insbesondere.* Leipzig, 1831. The nature of the manure modifies the quantity of earthy phosphates found in corn.

1000 Parts.	Quantity of Earthy Phosphates.	
Caseine . . .	60	Berzelius.*
Bones of Sheeps' feet . .	124.2	French Commission.†
——— Ox's head . .	327.7	Ditto.
Milk	2.55	Berzelius.
Blood (average) . .	0.6	Denis.‡

These are only some of the substances used as food in which phosphorus has been detected. But most organised substances contain it, usually in the from of phosphate of lime. Thus, in the ashes of almost every plant a phosphate is found. The crust, which is deposited in the boilers used for refining sugar, contains, according to Avequin,§ no less than 92.43 per cent. of sub-phosphate of lime; so that it is obvious that unrefined sugar must contain phosphorus.

These observations fully establish the correctness of Liebig's remark, that when flesh, bread, fruit, and husks of grain are used for food, more phosphorus is afforded to the body than it requires, and the excess is eliminated in the urine and excrement.

6. Sulphur.—Sulphur is a constituent of both animals and vegetables. Fibrine and albumen, and all tissues composed of these substances, contain it. If hydrochloric acid be added to a solution of flesh in liquor potassæ, some sulphuretted hydrogen is evolved and is detected by its staining paper, moistened with a solution of sugar of lead. The discoloration which a silver spoon suffers by being used in eating eggs, depends on the formation of sulphuret of silver. If some white of egg, boiled hard, be decomposed by heat, it evolves hydrosulphuret of ammonia, which discolours paper moistened with sugar of lead. Caseine also contains sulphur, as does likewise hair and bones. The efficacy of a mixture of finely powdered litharge and lime (*hair dye*) in staining the hair, depends on the formation of the black sulphuret of lead. The lime serves to form, in the first place, a sulphuret of calcium with the sulphur of the hair. Animal charcoal (*bone black*) evolves sulphuretted hydrogen, when treated with hydrochloric acid, showing that sulphur was a constituent of bones.

The existence of sulphur in so many animal substances, serves to explain the evolution of sulphuretted hydrogen and hydrosulphuret of ammonia, by putrifying animal substances; excrement for example. Indeed, so much sulphur is obtained in this way, that some geologists have considered it to be a source

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* *Traité de Chimie*, t. vii. p. 603.
† *Comptes Rendu des Seances de l'Academie des Sciences*, Août, 1841.
‡ *Recherches expérimentales sur le Sang Humain*, Paris, 1830.
§ *Journal de Pharmacie*, t. xxvii, p. 15.

of at least part of the native sulphur of the mineral kingdom.* That sulphuretted hydrogen is evolved in privies is proved by its darkening the white paint, and by its blackening silver articles (watches, coin, spoons, &c.) which have accidentally fallen into the night soil.

The sulphur of the metamorphosed tissues is thrown out of the animal system, principally in the form of sulphuric acid. The urine contains sulphates in part formed by the action of the oxygen of the arterial blood on the sulphur of the tissues. If the hollow of a tooth be filled with an amalgam of silver, a black crust of metallic sulphuret is speedily formed on it. Moreover, the leaden blue line, which borders the edges of the gums attached to the necks of the teeth, in persons whose constitutions are under the influence of lead,† is probably sulphuret of lead.

The system derives its sulphur from animal, vegetable, and mineral substances, used as food. Thus flesh, eggs, and milk contain it. Vegetable fibrine (as of corn), vegetable albumen (as of almonds, nuts, cauliflowers, asparagus, and turnips), and vegetable caseine (as of pease and beans) contain it. Lastly, sulphur, in the form of sulphate of lime, is a constituent of common and spring water.

TABLE OF THE QUANTITY OF SULPHUR IN SOME ALIMENTARY SUBSTANCES.

1000 Parts of	Quantity of Sulphur.	
Fibrine Albumen of eggs	From 3.6 to 3.8	Mulder.
Albumen of blood	6.8	Ditto.
Caseine	3.6	Ditto.
Vegetable fibrine ——— albumen ——— caseine	as animal fibrine, albumen, and caseine	Liebig.
Volatile oil of black mustard	204.8	
Sulphosinapisine (in white mustard)	96.57	

Celery, rice, hops, ginger, and many other vegetable substances contain sulphur. Asafœtida, which Dr. Ure says contains two per cent. of sulphur, is considered by some oriental nations as "*food for the gods.*"

An infusion of *white* mustard strikes a blood red colour with

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* Brocchi, quoted by Leonhard in his *Handbuch der Oryktognosie*, p. 599. Heidelberg, 1826. When the gate St. Antoine at Paris was pulled down in 1778, there were found in the ditches of that place, where many years (300?) previously excrement had been deposited, grains and crystals of sulphur deposited on lime. (Fougeroux de Bondarey, *Mém. de l'Academie Royale des Sciences*. Anneé, 1780, p. 105). It is stated in the *Athenæum*, (Dec. 1, 1838, p. 860), that Maravigno "disputes the assertions of Prof. Gemellaro, who pretends that sulphur owes its origin to the decomposition of mollusca."

† See Dr. Burton's paper on this subject, in the *Medico-Chirurgical Transactions*, 2d Series, vol. v. p. 63. 1840.

the persalts of iron, owing to the presence of sulphosinapisine. Both black and white mustard flour charred in a tube, evolve a sulphuretted vapour, which blackens paper moistened with a solution of acetate of lead. In the same way sulphur may be detected in cabbage, potatoes, and many other vegetable foods. If pease or almonds be boiled in a solution of caustic potash, and then hydrochloric acid be added, the evolved vapour blackens paper moistened with a solution of lead, thus showing that these seeds contained sulphur.

8. Iron. The ashes of most animals and vegetables yield traces of iron.

This metal is an essential constituent of the blood discs. From 10,000 parts of blood we can obtain about eight parts of peroxide of iron—equal to $5\frac{6}{10}$ parts of the pure metal. The hair also contains iron—the black the most, the white the least. Braconnot likewise found it in the gastric juice.

Liebig regards the compound of iron in the blood as an oxidized one. In the arterial blood, it is saturated with oxygen (*hydrated sesquioxide*); but during its passage through the capillaries, it loses part of its oxygen *, and becomes protoxide of iron, which combines with carbonic acid, one of the products of the oxidation of the metamorphosed tissues, and forms *carbonate of the protoxide of iron*, which exists in venous blood. This, in the lungs, absorbs the same amount of oxygen it had lost, and gives out its acquired carbonic acid.

Whether this be the true theory of respiration or not I shall not stop to inquire, though the fact, that for every volume of oxygen absorbed by carbonate of the protoxide of iron no less than four volumes of carbonic acid are evolved, appears to me to present some difficulties to its admission, since we know that in the process of respiration, the quantity, by volume, of carbonic acid expired, is not quite equal to that of the oxygen which has disappeared.

Iron is found in the yolk of the egg and in milk, foods intended by nature for the nourishment of young animals. In the milk it exists, according to Berzelius, as phosphate of iron. The flesh on which we feed, as well as most vegetables (mustard, cabbage, potatoes, pease, cucumbers, &c.) supply us with iron.

9. Chlorine. This element is a constituent of the blood, and of the gastric juice; and it is found in several of the excretions, as the urine, saliva, tears, and fæces. In the blood it exists in combination with sodium.

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* The facility with which, under certain circumstances, the peroxide of iron loses part of its oxygen has been recently applied by Sir J. F. Herschel in the production of photographic pictures, termed *ferrotypes*.

As the chloride of sodium of the blood is constantly being consumed in the formation of the gastric juice and other secretions, this salt becomes an indispensable article of food. To the embryo chick, nature has supplied it in both the white and yolk of the egg, while the young mammal finds it in his mother's milk. The appetite which all animals evince for salt, shows that it is an agent indispensable for their health. The common salt, therefore, which we consume at our tables is not to be regarded as a mere exciter of the palate; it is an essential article of food. It contains 60 per cent. of chlorine. It is probable, that besides furnishing the secretions with salt and its constituents, the salt of the blood performs some important function in relation to the blood discs. Every one well knows that in cholera, and some other maladies, the blood, which is deficient in its saline parts, has a very dark or black appearance.

But one of the most important uses of chloride of sodium (common salt) is the formation of hydrochloric acid, an essential ingredient of the gastric juice. By what particular agency, whether by electricity or affinity, this decomposition is effected, we are unable to determine precisely, but that the hydrochloric acid of the gastric juice derives its chlorine from the chloride of sodium, can scarcely be doubted. Its hydrogen is probably derived from water, the oxygen of which at the same time unites with sodium to form soda.

The gastric juice consists essentially of *water*, *gastric mucus*, and *hydrochloric acid*. As mucus is a fluid secretion of all the mucous membranes, while the mucus of the gastric membrane alone yields with water and hydrochloric acid a digestive liquor, it is probable, that the mucus of the stomach contains some peculiar organic principle, not hitherto isolated, on which its peculiar properties depend. To this principle, the term *pepsin* (from πεπτο, *I digest*) has been applied. An artificial digestive liquor is readily prepared by macerating the lining membrane of the fourth stomach of the calf in water, to which a few drops of hydrochloric acid have been added. If small cubes of white of egg, boiled hard, be macerated in this liquor, their more superficial parts become translucent, and their edges and angles rounded. Very gradually they are dissolved, presenting during the process, the appearance of a cube of soap, dissolving in water, and having a gelatiniform character. The yolk of egg yields a turbid liquor, owing to the presence of fat globules. A piece of cooked beef-steak becomes pulpy at the surface, and gradually dissolves

These changes are produced neither by an infusion of the stomach, nor by diluted hydrochloric acid employed separately; but by the two conjointly they are readily effected.

Now Liebig asserts "that the substance which is present in the gastric juice in a state of change, is a product of the transformation of the stomach itself;" and he goes on to state that "the fresh lining membrane of the stomach of a calf, digested with weak muriatic acid, gives to this fluid no power of dissolving boiled flesh or coagulated white of egg; but if previously allowed to dry, or if left for a time in water, it then yields to water, acidulated with muriatic acid, a substance in minute quantity, the decomposition of which is already commenced, and is completed in the solution."

But several circumstances appear to me to be opposed to this view. The fact ascertained by Schwann, that the solvent principle of the digestive fluid can be precipitated from its neutral solution by acetate of lead, and be obtained again in an active state from the precipitate by means of sulphuretted hydrogen, is apparently inconsistent with Liebig's idea, that this principle is matter in a state of decomposition or transformation. Moreover, if the essential part of the gastric juice—that by which digestion is effected—be a mere transformation of the stomach, how is it that other parts of analogous structure and composition do not suffer the same transformation? I have tried to obtain a digestive liquor from the second stomach of the calf, and from the bladder, but in vain. How is it that this fancied transformation goes on, during life, only when solicited to do so by the presence of aliment or by mechanical irritation? Dr. Beaumont ascertained that pure gastric juice will keep for many months without becoming fetid: a fact scarcely explicable on the hypothesis that its activity depends on a principle in a state of decomposition. I find that while acidulated infusions of the second stomach of the calf and of the bladder soon become putrid and fetid, that of the fourth stomach remains remarkably free from unpleasant smell for several weeks. Lastly, I find, contrary to Liebig's statement, that a digestive liquor can be prepared from the fresh undried fourth stomach of a calf.*

I cannot agree with Liebig, that digestion is a process analogous to fermentation; that, in fact, it is nothing more than the transformation of food, effected by the contact of matter in a state of decomposition. If it were, a small quantity of the gastric juice ought to be capable of effecting the digestion of an unlimited quantity of food. Now, the experiments of Dr. Beaumont on the natural gastric juice, and of Schwann on the artificial digestive liquor, prove that this is not the case. Both found that only a certain amount of food could be digested with a given quantity of gastric juice; and Dr. Beaumont observes, that

* White of egg thus digested was exhibited to the meeting.

"when the juice becomes saturated it refuses to dissolve more; and if an excess of food have been taken, the residue remains in the stomach, or passes into the bowels in a crude state."

10. Sodium.—The observations on chlorine apply in part to sodium, since these two elementary substances are usually taken into the system together, in the form of chloride of sodium, which is a constituent of the blood. I have already stated that common salt, by the aid of water, is converted in the system into hydrochloric acid (found in the gastric juice) and soda. The latter substance exists in the blood in combination with albumen (*albuminate of soda*). While potassium is the usual metallic basis of the alkaline salts of plants, sodium, on the other hand, is the basis of the alkali and alkaline salts of animals. All the animal tissues contain sodium, and their ashes (as of feathers, bristles, hairs, &c.) accordingly communicate a yellow tinge to flame.

The common salt, used at our tables as a condiment, contains forty per cent. of sodium. The soda, which exists in the blood in combination with albumen, passes out of the system in union with organic matter ($C_{70}\,H_{66}\,N_2\,O_{22}$) represented by *choleic acid;* in other words, bile may be represented as choleate of soda—that is, it contains the elements of this salt, though not necessarily arranged as such. Lastly, "the soda, which has been used in the vital processes, and any excess of soda, must be expelled in the form of a salt, after being separated from the blood by the kidney." (Liebig.) The acids with which, in the flesh-eating animals, the soda combines, are sulphuric and phosphoric. These are in part formed in the system by the oxidation of sulphur and phosphorus of the metamorphosed tissues.

11. Calcium.—This is a constituent of all animals. The bones of the vertebrata (as man) contain sub-phosphate (principally), but mixed with carbonate, of lime; while the shells and crusts of the invertebrated animals (as lobsters, oysters, &c.) consist of carbonate (principally), mixed with sub-phosphate, of lime. Muscles, nervous matter, the liver, thyroid gland, and, indeed, all the animal solids, contain calcium, usually combined with oxygen and phosphoric acid; the blood also contains it.

It is requisite that the food of young animals should contain sub-phosphate of lime for deposition in the bones; accordingly we find it in the egg and in milk. The more mature animal is supplied with it in the various forms of animal food on which he feeds, as well as in most vegetables. Seeds (especially corn), onions, garlic, &c. contain it.

Oxalate and other vegetable salts of lime are found in some vegetable foods; thus, the stalks of rhubarb, which are eaten in tarts and puddings, contain crystallized oxalate of lime. It is the same salt which gives to Chinese and Russian rhubarb its

grittiness when chewed. Gum and unrefined sugar yield ashes containing calcium; and the well known fact, that *strong* unrefined sugar becomes by keeping *weak*, is ascribed to the presence of lime, which by its action on sugar converts it into a soft, clammy, gummy matter. Grapes also contain calcium. Another source of calcium is ordinary water, which contains both carbonate and sulphate of lime.

12. Magnesium.—Minute quantities of this metal are found in the teeth, bones, nervous matter, the thyroid gland, and several parts of the body; it exists also in the blood. In every case, I believe, of its occurrence in the animal body, it is found in combination with oxygen and phosphoric acid, forming phosphate of magnesia; and in many cases with ammonia also.

Its source is of course to be found in the foods; not only the flesh but also the vegetables which we eat contain it—as seeds (especially of the cereal grasses) and potatoes. I have already referred to the large intestinal concretions (ammoniacal phosphate of magnesia), found in the intestines of horses, and which are derived from the husks of the oats on which these animals feed.

13. Potassium.—Minute traces of potassium have been detected in the solids (cartilage, liver, &c.), and in some of the fluids (blood, urine, milk, &c.). Liebig states, that "without an abundant supply of potash, the production of milk becomes impossible;" but I know not on what authority he makes this statement, for Schwartz found only seven parts of chloride of potassium (equivalent to 3.68 parts of potassium) in 10,000 parts of milk—a quantity apparently too minute to be of much importance.

The sources of potassium in our system are both animal and vegetable food. Most plants which grow inland contain it; thus, it is found in grapes and potatoes. Its presence may be readily detected: burn a grape stalk in the candle—the minute ash obtained at the point of the burnt stalk will, if introduced into the outer or almost colourless cone of the flame, communicate a violet tint, thus demonstrating the presence of potash.

14. Fluorine.—Berzelius detected minute quantities of fluoride of calcium in the bones and teeth of animals; but, more recently, Dr. G. O. Rees failed to detect it. If fluorine be a normal constituent of the body, it is doubtless introduced into the system in the small portions of the bones of animals occasionally swallowed with their flesh, for it cannot be derived from plants, since it has never been detected in these bodies. It is remarkable, however, that fluoride of calcium is abundant in fossilized bones, and in the human bones found at Pompeii and Herculaneum.

Conclusion.—If time had permitted me, I had intended to have concluded this lecture with a general review of the different topics

brought before you this evening. Even at this late hour you will, perhaps, permit me to remind you, that in estimating all the uses of food, it is necessary to consider the ultimate or elementary composition of the substances employed; since it is evident that several elements (such as sulphur, phosphorus, &c.), formerly regarded as accidental constituents of our food, are as essential to our health as carbon, hydrogen, nitrogen, and oxygen, which alone were formerly considered to be the essential elements. The necessity of nitrogenised aliments to the support of animal life was first asserted by Magendie. We are indebted to Liebig for suggesting the use which non-nitrogenised aliments serve in the animal economy, and which, it was also known, were necessary to life. There is, however, much yet to make out on this point. No plausible explanation has hitherto been offered of the necessity of the variation of diet, and the use of succulent vegetables or fruits for the preservation of health and life. Liebig has shown that food must contain both a plastic element of nutrition and an element of respiration; but it is well known that a diet (as of salt meat and biscuit) which fulfils both of these conditions, is not always sufficient to preserve health and life.

For the discovery of vegetable nitrogenised principles, identical in composition with animal fibrine, albumen, and caseine, we are indebted to Liebig and his pupils, as I have before mentioned. This distinguished Chemist asserts, that "the substance of cellular tissue and of membranes of the brain and nerves" are the only constituents of the animal organism which vegetables cannot produce. He has also offered a very plausible suggestion as to the use of gelatine as an article of food, and which requires further investigation. He does not think that proteine can be formed from it in the animal economy.*

With these remarks I must conclude this very long, and I fear very tedious lecture, by thanking you for the great attention and patience with which you have listened to me.

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* The relation of proteine and gelatine has been pointed out by Liebig. In further illustration I may add the following table:—

10 eq. proteine	C_{480} H_{360} N_{60} O_{140}	8 eq. gelatinous tissue	C_{384} H_{328} N_{60} O_{144}
48 eq. water	— H_{48} — O_{48}	4 eq. fat	C_{48} H_{40} — O_4
Total	C_{480} H_{408} N_{60} O_{188}	4 eq. sugar	C_{48} H_{40} — O_{40}
		Total	C_{480} H_{408} N_{60} O_{188}

LECTURE

ON THE STRUCTURE, AFFINITIES, AND MEDICAL PROPERTIES OF THE NATURAL ORDER RANUNCULACEÆ.

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Lecturer on Materia Medica and Therapeutics.

The order Ranunculaceæ constitutes one of a group of orders which are characterized by possessing a large amount of albumen in their seeds in proportion to the size of their embryo; hence they have been called, by Professor Lindley, *Albuminosæ*. They belong to the dicotyledonous class and polypetalous sub-class of plants. The possession of a large quantity of albumen, in proportion to the size of the embryo, has, for some time, been considered important by botanists; but it had not been made a matter of more than ordinal importance till Dr. Lindley published his "Nixus Plantarum," in which he brought together a number of orders that possessed this character, which had hitherto been widely separated. The propriety of such an arrangement must be admitted, as the presence of the albumen in so large a quantity indicates a peculiar constitution of the embryo, which requires for its growth, in the earliest stages of its development, a large supply of embryonic nutriment. It is by admitting this principle of classification, that the orders Umbelliferæ, Grossulaceæ, Vitaceæ, &c., have been placed near Ranunculaceæ, whilst, in other systems, they are placed at a great distance. Nor are there wanting subordinate characters to give to this group considerable compactness and strength of resemblance. Thus the genus *Thalictrum*, in its compound sheathing leaves, has a very evident relation to Umbelliferæ. Many other members of the various orders thus brought together have equally evident relations.

The principal orders thus brought together are *Ranunculaceæ*, of which we shall speak more particularly presently; *Papaveraceæ*, distinguished by their herbaceous character, parietal placentation, the parts of the flower arranged in twos or fours, and a milky juice; the properties of this order are narcotic, and to it belongs the *Papaver somniferum*, from which opium is obtained; *Nymphæaceæ*, herbaceous water plants, with seeds, having the embryo enclosed in a vitellus, and possessing slightly astringent properties, and of which the water-lily (*Nymphæa alba*) is the type; *Myristicaceæ*, with woody stems, unisexual flowers and columnar stamens, possessing acrid and aromatic properties, and from which the nutmeg is obtained; *Magnoliaceæ*, with

woody stem, stipulate dotted leaves, and bitter tonic properties; *Winteraceæ*, with stipulate dotted leaves, and aromatic and stimulant properties, yielding the winter's bark (*Drimys winteri*); *Anonaceæ*, with hermaphrodite flowers, and distinct stamens, and aromatic properties, yielding the *Piper æthiopicum*; *Umbelliferæ*, with inferior didymous fruit, and containing poisonous stimulant, eatable, and aromatic plants, as hemlock, parsley, parsnip, and anise; *Grossulaceæ*, with inferior fruit, racemose flowers, and parietal placentæ, containing the harmless currant and gooseberry; *Berberaceæ*, with recurved valves and anthers, of which the acid and astringent berberry (*Berberis vulgaris*) is the type and representative; *Vitaceæ*, with united two-celled fruits, central placentæ, and few seeds, affording the grape (*Vitis vinifera*). I shall not mention the less important orders. Through these there will be seen to run a community of property as well as structure. Thus *Vitaceæ*, *Berberaceæ*, and *Grossulaceæ* possess acid properties; *Umbelliferæ*, *Anonaceæ*, and *Myristicaceæ*, aromatic properties; whilst acrid and narcotic properties are found in *Ranunculaceæ*, *Papaveraceæ*, and some *Umbelliferæ*.

The order Ranunculaceæ consists of herbs and shrubs, with alternate or opposite, entire or dissected leaves, embracing the stem. The calyx has mostly five sepals, sometimes coloured. The corolla has five petals, or some multiple of that number: and they are sometimes wanting. The stamens are numerous, with two anthers. The carpels are numerous, with one or many seeds. The embryo is small and surrounded by a large quantity of albumen.

The order contains thirty-nine genera, including several hundred species. The genera are arranged in five tribes, or sub-orders, of which the following is an analysis:

Anthers bursting inwards	*Pæonieæ.*
Anthers bursting outwards	
Petals absent	*Clematideæ.*
Petals present	
Nectaries present :.....	*Ranunculeæ.*
Nectaries absent	
Many seeds	*Helleboreæ.*
One seed	*Anemoneæ.*

The species of this order are eminently European, and are found in the temperate parts of the earth. When tropical, they inhabit mountainous regions. Of the thirty-nine genera, twenty-seven are, according to Koch, natives of Germany, containing 109 species.

The principal botanical relations of Ranunculaceæ are with the

orders with which it is connected by its albuminous seeds. There is an apparent resemblance to Rosaceæ, from which they are disguished by their albuminous seeds, hypogynous stamens, exstipulate leaves, and acrid properties. With monocotyledonous plants they are connected through the order Alismaceæ, which has numerous carpels. The tendency of several of the genera as Aquilegia, Aconitum, and Delphinium, to develope irregular flowers, is a remarkable structural peculiarity. The spur-like appendages of these flowers may be referred to a regular morphosis. In Aquilegia, as shown satisfactorily by Morren, they are stamens assuming a petaloid character. The spur-shaped bodies in delphinium and aconitum, I apprehend, are, on the contrary, a tendency in the petal to develope stamens.

The plants of this order are all of them suspicious—many are highly poisonous—all of them are more or less acrid and caustic. De Candolle, who is often quoted on this point, says, on the authority of Krapfen, that the caustic principle of these plants is destroyed by drying, and by being immersed in water, and is increased by acid, sugar, honey, wine, spirit, &c. There is something like a ground for this statement in the facts, that some of the crowfoots will injure animals when eaten fresh, but are perfectly innocuous when dry. The species, also, which grow in water, as the *Ranunculus aquatilis*, &c., may be eaten at any time by animals with perfect impunity.

The pœony tribe (*Pœonieæ*) deriving their name from Pœon, who is said to have cured Pluto of a wound given him by Hercules, by its means do not possess the active properties attributed to them by the ancients. The *Pœonia officinalis* is said to have medicinal properties, and the roots of other species, as the P. *anomala* and *albiflora*, according to Pallas, are eaten in Siberia. The *Cimicifuga fœtida*, bugbane, is used for driving away vermin. *C. serpentaria* is used in North America as an astringent. The *Actææ*, or baneberries, are all of them poisonous. The most remarkable use of the tribe is the cultivation of the *Pœonia moutan*, which is a native of China, and its handsome red and scarlet flowers are deservedly favourites in our gardens.

The Clematis tribe (*Clematideæ*) present nothing more remarkable than the genus which is its type. The traveller's joy, the virgin's bower, as their names would lead us to infer, are favourites everywhere. Their climbing habit gives them a very desirable character for gardens. The *Clematis vitalba* is a native of Great Britain, and at this time of the year, both with its flowers and its feathery persistent styles commands those feelings which make its common name very appropriate. The properties of this genus are similar to the order: they contain an acrid caustic principle, and have sometimes been used in medi-

cine. When applied to the skin, the *C. recta*, *flammula*, and *Mauritiana*, produce vesication, and might be employed as counter-irritants. Störck employed the *C. recta* in syphilitic disease. Nearly one hundred species of this genus are known. In structure these plants are remarkable for possessing no petals, but their large coloured calyx serves the office of petals. The style also developes with the fruit, and in many species forms a handsome appendage to the carpels, as it is mostly clothed with long hairs.

The crow-foot, or frog-wort tribe (*Ranunculeæ*), are known by a little scale on the claw of their leaves called a nectary. The genus *Ranunculus* possesses generally vesicating properties, though stronger in some species than in others. The *Ranunculus sceleratus* is the *herba sardonica*, sardonic herb of the ancients, on account, it is said, of its producing the sardonic grin when taken. It is an excessively acrid plant. Orfila killed dogs by applying an extract of it to wounds in the skin, and Kempf says, he was nearly poisoned by eating a single flower. It may not always be so active as this, but care should be taken in the employment of it. It is an inhabitant of Britain. *R. acris* and *flammula*, both common plants in our fields and ditches, possess the same acrid properties. *R. thora* is very poisonous, having been used by the Swiss hunters for the purpose of envenoming their darts. Some of the Ranunculi have handsome flowers; the *R. lingua* is the finest British species. *R. asiaticus* is the common garden ranunculus. It is its tendency to become double, and the great variety of colours it assumes, that makes this flower so popular amongst florists.

The Hellebore tribe (*Helleboreæ*) is distinguished in the family by its many seeded capsules. It contains the most active plants of the order, as aconite, larkspur, and hellebore. The name *aconite* is derived from Aconia, a city in Bithynia, where the ancient ακονιτον is said to have grown, but it is not at all certain that the modern aconitum is the same as the ancient plant. On account of its poisonous properties, it is called *wolfsbane*, and the peculiar form of its flowers has given it the name of *monks-hood*. This genus has a great number of species, all possessing poisonous properties. The species most commonly known is the *Aconitum napellus*. It has a great tendency to vary, according to the different circumstances in which it may grow; and hence a great number of varieties of this plant have been recorded. Some of them, as is mostly the case, have been elevated to the importance of species. Such are probably *A. paniculatum* and *A. Stoerkianum*. The former of these is the plant directed to be used in medicine by the London Pharmacopœia, but in the making the preparations of the aconite, the varieties of the *A. na-*

pellus are indiscriminately used by the apothecary. The active principle of the aconite is an alkaloid, called *aconitia*, which is found in combination with aconitic acid. It may be separated by a process similar to that employed for obtaining other proximate vegetable principles. It is very expensive, on account of the small quantity that exists in the plant—the four or five drachms which I hold in my hand, prepared by Mr. Morson of Southampton-row, are worth about £40. There is much spurious aconitia in the market, brought from France, and much less expensive.

Aconite acts especially on the sensitive function of the nervous system. The leaves or root chewed numb the tongue and sides of the mouth: hence it is employed as a topical application in cases of neuralgia. It has a decided influence on the heart's action diminishing its force, and frequency, and may be administered where tartar emetic would not be borne.

The extract and alkaloid are the pharmacopœial preparations; the latter is very expensive, and requires, on account of its violence, the greatest caution in its use; the former is very uncertain in its effects. The tincture of the root secures the most uniform results.

In making the extract from the leaves, the best time to gather the plant is before the flowers open, for during the process of the impregnation of the ovules and the maturation of the ovary, the proper juices in the leaves and other parts of the plants are made use of, and they thus become exhausted of their active ingredients.

The *Aconitum ferox* is a Nepaul plant, and possesses more actively poisonous properties than any of the European species.

Another poisonous plant of this tribe is the Hellebore. It had a great reputation amongst the ancients, but has been much less used in modern times. All the species of hellebore possess active properties, that employed by the College of Physicians is the *Helleborus officinalis* of Sibthorp, the H. *orientalis* of other authors. This is undoubtedly the ancient Greek species, and is intermediate between the H. *niger* and H. *viridis*. It is, however, the H. *niger* that yields the *radix hellebori* of commerce. This is said to be frequently mixed with the roots of the H. *viridis* and *fœtidus*.

Hellebore possesses the acrid caustic properties of the whole order, conjoined with the narcotic property of the aconite, and acts as a drastic purgative.

The genus Delphinium, or larkspur, resemble the two last in possessing active properties. An alkaloid is obtained from the seeds of the *Delphinium staphisagria*, lousewort, called *Delphinia*, which has an action on the animal system resembling aconitia.

It has been employed successfully in the same cases as aconitia, and promises to be a good substitute for that more unmanageable medicine. The seeds of the larkspur only are used in medicine, although there are nearly sixty species. It is probable that the others also possess the same active properties. The seeds of the common garden larkspur, *Delphinium consolida*, are known to be poisonous.

The other genera of this tribe are not so well known. The species of Aquilegia (columbine) are much cultivated in gardens; like the monkshood and larkspur, it is remarkable for the irregularity of its flowers; and its Latin name *aquilegia*, and English name *columbine*, are derived from *aquila* and *columba* (eagle and pigeon), because their petals bear a resemblance to those birds. The columbine was not only a favourite flower, but a favourite remedy, amongst the ancients. It has now, however, lost its position in medicine. The whole of the species possess the acrid properties of the order.

The anemone tribe (*Anemoneæ*) possess but a few genera, and these not used in medicine. The genus *Thalictrum* (meadow rue) has active properties, and many of its species have been employed as remedies. The roots of *Thalictrum flavum* are used for dyeing yellow; and when the old doctrine of "signs and seals" prevailed, it was administered in jaundice, as its yellowness was supposed to indicate the nature of the diseases for which it was adapted. The genus Anemone abounds with species that are well known, as spring-flowers in our gardens; but they are little used in medicine, although Störck, and other writers, have strongly recommended them. Their properties seem to depend on the possession of the volatile acrid principle that abounds in the whole order.

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Mr. Squire.—*The fresh roots of the following plants, preserved in spirit:* Aconitum napellus—Angelica—Daucus carota — Conium maculatum— Malva sylvestris—Lactuca virosa — Leontodon taraxacum — Daphne mezerium—Daphne laureola — Hyoscyamus niger — Nicotiana tabacum — Datura stramonium—Solanum nigrum — Solanum tuberosum — Solanum dulcamara — Allium porrum—Acorus calamus — Colchicum autumnalis. *The following plants, dried:* Aconitum napellus — Conium maculatum— Ruta graveolens—Tussilago farfara — Hyoscyamus niger — Atropa belladonna—Digitalis purpurea. Potassæ nitras (large crystals).

Mr. Morson. — Part of the stem of the Manna Ash, showing the incisions. *Specimens of*—Pure iodine—Amygdaline—Salicine—Piperine—Cholesterine — Berberine — Eblanine — Asparagine — Narcotine—Narceine— Morphia (crystallized)—Veratria (pure)—Veratria (medicinal)—Aconita (crystallized)—Conia—Brucia—Morphiæ acetas—Morphiæ murias—Morphiæ hydriodas—Strychniæ sulphas—Strychniæ hydriodas—Cinchoniæ sulphas—Bruciæ sulphas—Acidum succinicum—Acidum Gallicum—Acidum tannicum (pure)—Ferri phosphas—Ferri oxyphosphas—Hydrargyri bicyanidum—Hydrargyri biniodidum (different forms)—Hyposulphite of soda— Nux Vomica bark—St. Ignatius's beans —True Crabs' Eyes — Sugar of grapes—Sugar of milk—Sabadilla seeds.

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CHEMICAL EXAMINATION OF ANGELICA ROOT.

BY M. BUCHNER, JUN.

M. Buchner has found the following substances in angelica root:—essential oil; a peculiar acid, volatile (*angelicic acid*); a matter similar to wax (*wax of angelica*); a crystallizable resinoid (*angelicine*); a brittle amorphous resin—a bitter principle; tannin, forming a green precipitate in solutions of iron; malic acid, partly free and partly combined; crystallizable and amorphous sugar; extractive matter, similar to gum; starch; albumen; vegetable gelatine (*pectic acid*); vegetable fibre; several salts, such as the phosphate of magnesia, with a little phosphate of lime, malates, pectates, chloride of potassium, sulphate of potash, sulphate of lime, silicic acid, and oxide of iron.

THE ESSENTIAL OIL.

This oil, which is obtained by the distillation of the root with water, differs from that which M. Buchner found to be volatilized in boiling balsam of angelica* with potash: the former has the peculiar odour of angelica, and a hot aromatic taste, which lasts for a long time; the latter has a finer, more penetrating smell, something like camphor, and a taste which is less permanent—hot, it is true, but, at the same time, refreshing. This is evidently either one of the principles contained in the other, or else a product of the action of potash on the essential oil contained in the balsam. Both these oils are lighter than water, and may be dissolved in it to a considerable extent. Although nearly colourless at first, they become darker and more resinous with age.

* Balsam of angelica is a soft resin, evidently of a complex nature, of the consistence of thick syrup, having a strong smell and hot aromatic taste. It is extracted by means of ether, from the alcoholic extract of angelica root, and has been named balsam of angelica by the discoverers of it, Messrs. Bucholz and Brandes.

ANGELICIC ACID.

This acid is found combined with potash in the alkaline liquor obtained by heating the balsam of angelica with caustic potash. Liberated by a stronger acid, it is distinguished by its strong smell, offering much resemblance to that of valerianic acid. It exists also in considerable quantity in the alcoholic solution of the balsam treated with potash, and from which the wax and angelicine have been previously extracted by means of ether. On adding sulphuric acid to the solution, a very strong penetrating smell is developed, capable of filling a large space, and the angelicic acid separates, when the quantity is considerable, in soft oleaginous masses, which, after a time, begin to crystallize. If the whole be submitted to distillation, the angelicic acid passes over, partly dissolved in the water and partly in the form of drops of oil, which swim on the surface of the other. On saturating this product with potash, evaporating, and again distilling the salt of potash with concentrated aqueous phosphoric acid, the angelicic acid may be obtained in a state of complete purity.

Without absorption, and without any loss, the oily acid, left undisturbed, solidifies at a few degrees above the freezing point, and forms a number of large striated prisms, some isolated and others placed at a fixed angle, like a feather. These melt, and again become oily at a more elevated temperature.

The smell of angelicic acid, as has already been remarked, is strong; somewhat resembling that of valerianic acid, and also that of acetic acid. Its taste is not less decided; it is very acid, and, at the same time, hot, like concentrated acetic acid. It produces on the tongue the sensation of burning, which always goes off speedily and completely.

This acid forms with the alkalies and the alkaline earths, soluble compounds, which form white precipitates in solutions of silver and of lead, but which precipitates are completely soluble in a large quantity of water. If the combination with oxide of silver be left by itself for some time, the silver will be reduced in the form of a black powder. Solutions of copper produce with the angelicates of the alkalies a bluish white cloud, which again disappears on further diluting the liquor. Chloride of mercury causes no change in the angelicates; but the proto-nitrate of mercury forms a white precipitate, soon passing to grey, while the proto-valerianate of mercury remains white.

The angelicates of the alkalies form in solution of chloride of iron a precipitate of a flesh colour, which it is difficult to distinguish from benzoate of iron. The valerianate of iron is precipitated of a red brown, and this is re-dissolved by the addition of water, which is not the case with the angelicate of iron.

It will be seen, then, that angelicic acid partakes partly of the

properties of acetic and valerianic acids, and partly of those of benzoic acid, without being identified with either. But it is distinguished from all other acids by the property which it possesses of passing in so easy and complete a manner from the oily and amorphous to the crystalline state.

The angelicic acid cannot be liberated, as valerianic acid is, by the simple distillation of the root with water, for the product of the aqueous distillation is not at all, or scarcely at all acid, and contains, as has been said, a neutral essential oil. This oil of angelica, therefore, appears to be, as well as the oil of valerian, cloves, &c., a combination of a volatile acid with a basic essential oil, which has been extracted from the balsam of angelica by the distillation with potash; unless it be admitted, that these substances are formed by the action of caustic potash on the essential oil of angelica, causing a transposition of the elements and an absorption of oxygen. M. Buchner proposes to resolve this question by an ultimate analysis. He remarks, however, that in heating the balsam of angelica in a retort, with water alone, he obtained a liquid in distillation, which afforded an acid re-action, and in which he could discover a small quantity of angelicic acid. It was this, in fact, which first led to his experiments.—*Journal de Pharmacie.*

THE CHANGE WHICH EXTRACT OF RHUBARB UNDERGOES IN KEEPING.

It has been observed some time ago, by M. Landerer, that old extract of rhubarb, when mouldy, acquires a strong smell of storax. This has been confirmed by M. Reinsch, in the case of fluid extract of rhubarb which had been kept for several years in an unopened bottle, the extract being covered with a film of mould. This liquid extract was submitted to distillation, and afforded a slightly turbid water, with a great number of small drops of oil. The product of the distillation had a strong smell of storax, and was neutral to test paper. Ether, after agitation with it, becomes slightly coloured yellow, and acquires the odour of storax; after the evaporation of the ether on a watch-glass, there remains only a few drops of an aromatic oil, smelling strongly of storax, but which is very volatile, so that in about an hour no trace of the smell could be discovered on the glass. This smell of storax in extract of rhubarb, which has become mouldy, arises from the formation of a peculiar oil. There will probably be many more of these oils discovered, originating in the putrefaction of vegetable matter. This oil of rhubarb appears to be analogous to the oil with the smell of musk, discovered by M. Rossignon, in decayed apples, which he has named *maloïle*, and which is composed of C H N O.—*Repertorium fur die Pharmacie.*

BRANDISH'S SOLUTION OF POTASH.

Best American Pearl-ashes	6 pounds
Quick-lime, fresh prepared	
Wood-ashes (from the Ash) of each . .	2 pounds
Boiling water	6 gallons

Add first the lime, then the pearl-ashes, and afterwards the wood-ashes to the boiling water: then mix. In twenty-four hours, the clear liquor may be drawn off *.

CONCENTRATED CAMPHOR JULEP.

TO THE EDITOR OF THE PHARMACEUTICAL JOURNAL.

SIR,

I OBSERVE in your Notices to Correspondents a reference to a formula for concentrated camphor julep, on which I beg to offer a few remarks. It is well known that myrrh and camphor exert a mutual action on each other, by which their solubility in water is increased; and that the alcoholic solution of these substances, as in the formula referred to, may be mixed with water without the separation of either. This may be a very useful combination for the practitioner who compounds the medicines he prescribes; but I conceive the dispensing Chemist is not at liberty to substitute it for the mistura camphoræ of the Pharmacopœia, which is a uniform and unobjectionable compound, when properly and recently made, and neither troublesome nor expensive in its preparation.

The proportions in which Mr. Ladbury's concentrated julep is to be used are not stated; but it is evidently impossible so to employ it as to produce a mixture exactly resembling that of the College. Independently of the introduction of an extraneous ingredient, we must either have a considerable deficiency of camphor, or excess of spirit. The preparation of the Pharmacopœia is usually estimated to contain about one grain of camphor in an ounce—to produce an article of the same strength, we must use a quantity of the concentrated julep, containing two hundred times the quantity of spirit directed by the College; or if employed in the more usual proportion of one drachm to four ounces of water, we should have a compound containing about one-seventh of the due quantity of camphor.

It may perhaps be thought that I am investing the subject with more importance than belongs to it; but I refer to it chiefly as a specimen of a large class of substitutions, which, I fear, are too generally practised; and which, I trust, your Journal, and the Society with which it is connected, will ever discountenance. I am, Sir, your obedient Servant, B.

* See Dr. Pereira's Materia Medica, *second edition* (1842), Vol. I. page 488.

LINIMENTUM HYDRARGYRI NITRATIS.

TO THE EDITOR OF THE PHARMACEUTICAL JOURNAL.

SIR,—In answer to D. B.'s enquiry, you state that you have not seen any published formula for the Lin. Hyd. Nit. Allow me to state, that there is a preparation of that name in the Pharmacopœia Mancuniensis, 1827, under the authority of Drs. Holme, Mitchell, Lyon, Carbutt, Bardsley, and Hulme; and of Messrs. Simmons. J. Thorpe, Ransome, Ainsworth, R. Thorpe, and Wilson, Surgeons, viz.

LINIMENTUM HYDRARGYRI NITRATIS *.

℞ Unguenti Hydrargyri Nitratis, ℥iiss.
Cerati Simplicis, ℥viiss.
Olivæ Olei, f℥v. Misce.

I am, Sir, yours, respectfully, ⊙.

* Since the above was in type, we have been favoured with communications containing the same information, from Mr. Woolley and Mr. Barker, of Manchester.

N. B. The library of the Pharmaceutical Society does not contain a copy of the Manchester Pharmacopœia.

METHOD OF ASCERTAINING THE PRESENCE OF IODINE IN THE OIL OF COD'S LIVER.

FOUR ounces, at least, of the oil to be examined, are to be treated with excess of solution of potash, moderately diluted. This is afterwards to be heated, until the whole of the liquid is evaporated; but taking care that the temperature is not raised to the boiling-point. Collect the residue of this evaporation; throw it, a small quantity at a time, into a large crucible, and proceed to carbonize it, taking the precaution, towards the end of the operation, to place a well-fitted cover over the crucible, so as to prevent the volatilization of the combination of iodine which may be formed. The carbonized residue is now to be boiled several times with alcohol; after which, these solutions are to be mixed together, and evaporated nearly to dryness. Dissolve this product in a small quantity of distilled water; add a slight excess of sulphuric acid, and either carburet of sulphur, or, what is better, a little fresh starch, with one drop of solution of chloride of lime. In this manner, the least trace of iodine may be discovered, and it will be found that the pure oil of cod's liver always contains a minute portion.—*Journal de Chimie Médicale.*

SUB-OXIDE OF LEAD.

IN decomposing the dry oxalate of lead, at a temperature of 530° Fahr., in an oil bath, Pelouze has obtained with facility the sub-oxide of lead which was discovered by Dulong. This oxide is pulverulent, sometimes dull, sometimes rather bright. Heated to dull redness, it is decomposed, being transformed into a mixture of the protoxide and metallic lead. Calcined, in contact with the air, it is oxidized, and passes to the state of protoxide, the weight of which is, to that of the sub-oxide, as 103.7 is to 100. The formula of the sub-oxide is Pb_2 O.—*Annales de Chimie et de Physique.*

LACTATE AND VALERIANATE OF QUINA.

UNDER the direction of Prince Lucien Buonaparte, these preparations have been administered by several medical men as remedies in cases of intermittents, especially fevers, and the quartan fever which prevails in the district of Rome.

From the observations which have been made, it appears that the lactate of quina has proved beneficial in those cases where the action of the sulphate is too violent—its ready solubility renders it more easily assimilable.

"The valerianate of quina is very soluble in water, less disagreeable in taste, less bitter, and less expensive," the author says, "than the lactate or the sulphate."—*Journal de Chimie Médicale.*

ADULTERATION OF CHEMICAL, PHARMACEUTICAL, AND COMMERCIAL SUBSTANCES.

The following notice is published in the August number of the *Journal de Chimie Médicale*:—

"In consequence of the numerous adulterations by which various products are deteriorated, and which are alike prejudicial to commerce and to the public health, the editors of the *Journal de Chimie Médicale* are induced to offer five silver medals, to be awarded to the authors who shall furnish to the Journal the best notices on adulterations not yet made known, and on the means of detecting them.

The editors, in publishing such notices, cannot hope to put an entire stop to adulterations, but are anxious to render such practices less frequent by pointing out the means of detection."

REVIEW.

The Pharmacopœia of the United States of America. *By Authority of the National Medical Convention, held at Washington,* A. D. 1840. Philadelphia: *Grigg and Elliott,* 1842. Pp. 279, 8vo.

Scientific Pharmacy has been more ardently and successfully cultivated in the United States of America than in the mother-country. In proof of this assertion, we appeal to the numerous excellent works on Materia Medica and Pharmacy published in the Union during the last century; to the fact that, from the year 1830 until the present period, the Americans have supported a Pharmaceutical Journal; and, lastly, to the circumstance that there are, at the present time, no less than three Colleges of Pharmacy within the Union—namely, one at Philadelphia, a second at Boston, and a third at New York.

The great success which has attended the establishment of the Pharmaceutical Society of Great Britain, and the support which this Journal has received, sufficiently prove that the Pharmaceutists of this country are not behind their Transatlantic kinsfolk in anxiety to become acquainted with the passing events and discoveries in Pharmacy, and to contribute their practical information to the common stock. Unequalled as this country is in the magnitude of her Chemical and Pharmaceutical establishments, in the spirit with which they are conducted, and in the amount of capital embarked in them, she ought to have taken the first rank in scientific Pharmacy: we trust that in a few years she will have done so.

The first edition of the *Pharmacopœia of the United States of America*, was published towards the close of the year 1820, under the authority of the National Medical Convention, held at Washington on the 1st of January of that year. At this meeting arrangements were made for the decennial revision of the work. Accordingly the second edition was prepared in 1830, though it was not published until the following year; and the third edition, resolved on at a meeting of the Convention in 1840, has only just appeared.

Unlike the British Pharmacopœias, it is not the produce of any one college or chartered body, but is the joint production of delegates from all the medical institutes of the Union. We find at the Convention held at Washington, on the 1st of January, 1840, delegates from all the Medical Societies, Colleges, Universities, and Faculties of the Union. The Convention appointed a committee of revision and publication, consisting of Drs. G. B. Wood, F. Bache, and R. Dunglison, of Philadelphia; Dr. J. J. Cohen, of Baltimore; Dr. T. C. Dunn, of Newport, Rhode Island; Dr. W. B. Stevens, of Savannah, and Dr. T. Sewall, of Washington. It would appear that the first four of these gentlemen were the most active members of the committee, and they were aided by the Colleges of Pharmacy before referred to, but especially by the one at Philadelphia, which appointed a committee of their own body to make a careful revision of the entire work. We are particular in referring to these matters because we think it possible that our own national Pharmacopœia might be improved by the *joint experience* of Physicians and Pharmaceutists.

The first and second editions of the United States' Pharmacopœia were printed in Latin and English; the Latin on the left hand page, the English on the right. In the third or present edition, the English language is exclusively employed, by which the labour and expense incurred by printing in duplicate is avoided.

The contents of the work are distributed under the two heads of *Materia Medica* and *Preparations*, as in the British Pharmacopœias. The articles of the Materia Medica, however, are arranged in two lists—the secondary list including those substances only which are but little employed or of doubtful value. To a few of the articles short notes have been affixed, indicating a ready mode of ascertaining their genuineness and purity. The following is an example:—

"Acidum Sulphuricum. *Sulphuric Acid.*—Sulphuric Acid of the specific gravity 1.845. Sulphuric acid is colourless; is entirely volatilized by a strong heat; and when diluted with distilled water, is not coloured by sulpho-hydric acid."

Sulphuretted hydrogen, here called sulpho-hydric acid, is em-

ployed as a test for any metallic impregnation, especially lead and arsenic, with the former of which it yields a black, with the latter a yellow, precipitate. *Marsh's test* is, we believe, a much more delicate test of the presence of arsenic than sulphuretted hydrogen.

Those who do not possess Marsh's apparatus will find the following method a simple substitute :—

Put a few small pieces of pure zinc into a wide-mouthed two-ounce phial: pour over them the suspected acid, previously diluted with water (one volume of oil of vitriol to seven or eight of water) so as to fill three-fourths of the phial. Then adapt to the mouth of the phial a cork perforated by a tobacco pipe. If arsenic be present, arseniuretted hydrogen will be given out, which is known by its alliaceous odour, by its burning with a bluish white flame and the evolution of a white smoke *(arsenious acid)*, and by its depositing a black crust (*metallic arsenicum*) on window glass, a white plate, or talc (*mica*) held so as to cut the flame, and thereby to impede its combustion.

We observe that in the United States the name of *Penny-royal* is applied to the *Hedeoma pulegioides*, a labiate plant, which must not be confounded with our English pennyroyal (Mentha Pulegium). The term "*Indian Hemp*" is applied in America to the *Apocynum Cannabinum;* whereas in Europe and the East Indies, it means the Cannabis Indica, a totally dissimilar plant. These differences in the meaning of words are greatly to be regretted; and are to be especially noted by every British Pharmaceutist who may have occasion to consult the American Pharmacopœia. Moreover, we observe that both cinnamon and cassia lignea are included under the name of "*cinnamon*," and, consequently, no distinction is made between oil of cinnamon and oil of cassia; both being denominated "oleum cinnamomi."

Catechu is declared to be the extract of the wood of *Acacia Catechu*. We are not quite sure what are the kinds of astringent extracts sold in the United States as catechu, but suspect they are similar to those of the London shops. If so, no less than three plants yield them. The *catechu in square cakes* of English Druggists, is in fact *gambir*, and is an aqueous extract of the prunings of *Uncaria Gambir*, prepared at Singapore. It is used by tanners under the name of *Terra japonica*. The catechu, in round flat cakes covered with paddy husks and sold as *Colombo catechu*, is an extract of the betel nut (the seeds of the *Areca Catechu* palm). Lastly, the large massive catechu, sold as *Cutch* or *Pegu catechu*, is an extract of the wood of *Acacia Catechu*. It follows, therefore, that this alone is the catechu of the London and United States' Pharmacopœias; but the Edinburgh College

has very properly included all the extracts just referred to under the name of *catechu*.

American turpentine (*Terebinthina*) is correctly declared to be "the juice of *Pinus palustris* and other species of *Pinus*" [as *P. tœda*]. Now the greater part of the turpentine used in this country being imported from the United States (New York), it follows that the London College has committed an error in refering common turpentine (*Terebinthina vulgaris*) to *Pinus sylvestris* exclusively; in fact, we doubt whether this species yields any of the turpentine now in use in this country.

We proceed to offer a few observations on some of the *preparations* of the United States' Pharmacopœia, premising that many of the processes are taken wholly, or in part, from the London and Edinburgh Pharmacopœias. In the preface we are told, that the Committee of Revision adopted these processes in preference to others, when they could wholly approve of them—

"From a disposition to promote uniformity in the preparation of medicines, so far as practicable throughout those countries in which the English language is used."

As in the Edinburgh Pharmacopœia, two modes of preparing tinctures are admitted, viz., the old method by digestion, and the new one by percolation or displacement. The latter is by far the most expeditious process, but it requires considerable skill and practice for its successful performance.

"Hydrargyri Iodidum Rubrum. *Red Iodide of Mercury. (Biniodide of Mercury).*—Take of corrosive chloride of mercury an ounce; iodide of potassium ten drachms; distilled water two pints, [wine measure]; dissolve the chloride of mercury in a pint and a half, and the iodide of potassium in half a pint of the distilled water, and mix the solutions. Collect the precipitate upon a filter, and, having washed it with distilled water, dry it with a moderate heat, and keep it in a well-stopped bottle."

This method of preparing red iodide of mercury by double decomposition we consider to be superior to that of trituration adopted by both the London and Edinburgh Colleges; for when large quantities of mercury and iodine are rubbed together, considerable heat is evolved, by which part of the iodine is volatilized.

"Pilulæ Catharticæ Compositæ. *Compound Cathartic Pills.*—Take of compound extract of Colocynth in powder, half an ounce; extract of jalap, in powder, mild chloride of mercury, each, three drachms; gamboge, in powder, two scruples. Mix them together, then with water form them into a mass, to be divided into one hundred and eighty pills.

Though a cathartic pill composed of compound extract of colocynth and calomel, is in frequent use in this country, we have no officinal formula for it in the British Pharmacopœias. Three of the above pills, weighing $10\frac{2}{3}$ grains, contain four grains of compound extract of colocynth, three of extract of jalap, three of calomel, and two-thirds of a grain of gamboge. One pill acts

on the bowels mildly—three pills very actively. These pills are adapted for costiveness, with congestion of the liver.

"Syrupus Sarsaparillæ Compositus. *Compound Syrup of Sarsaparilla.*—Take of Sarsaparilla, bruised, two pounds; guaiacum wood, rasped, three ounces; hundred-leaved roses, senna, liquorice root bruised, each two ounces; oil of sassafras, oil of anise, each, five minims; oil of partridge berry, three minims; diluted alcohol [proof spirit] ten pints [wine measure]; sugar eight pounds. Macerate the sarsaparilla, guaiacum wood, roses, senna and liquorice root in the diluted alcohol for fourteen days, then express and filter. Evaporate the tincture by means of a water-bath to four pints, filter, add the sugar, and proceed in the manner directed for syrup. Lastly, having rubbed the oils with a small quantity of the syrup, mix them thoroughly with the remainder.

Compound syrup of sarsaparilla may also be prepared in the following manner :—

"Take of sarsaparilla, ground into coarse powder, two pounds; guaiacum wood, rasped, three ounces; hundred-leaved roses, senna, liquorice root, each, in coarse powder, two ounces; oil of sassafras, oil of anise, each, five minims; oil of partridge-berry three minims; water a sufficient quantity; sugar eight pounds. Mix the sarsaparilla, guaiacum wood, roses, senna, and liquorice root, with three pints of water, and allow the mixture to stand for twenty four hours. Then transfer the whole to an apparatus for displacement, and pour on water gradually until one gallon of filtered liquor is obtained. Evaporate this to four pints, then add the sugar, and proceed in the manner directed for syrup. Lastly, having rubbed the oils with a small portion of the syrup, mix them thoroughly with the remainder.

This syrup is an imitation of the celebrated French *Sirop de Cuisinier*. The oil of partridge-berry* is obtained by distillation from the leaves of the *Gaultheria procumbens*. It is principally employed as a flavouring ingredient. Swallowed accidentally in the dose of a fluid ounce, it has, in more than one instance, caused inflammation of the stomach which proved fatal. The dose of syrup of sarsaparilla is half a fluid ounce to an ounce. Half an ounce is equivalent to a drachm of the root.

With these extracts and commentaries we must close our notice of this work; and, in so doing, beg to express our high opinion of its merits. It is obvious that it has been very carefully prepared, and it reflects great credit on those who have had the charge of its production.

A Treatise on Mineral Waters; *with Particular Reference to those prepared at the Royal German Spa at Brighton.* By J. C. A. Franz, M.D., &c., 12mo, pp. 154.

The author commences with a detail of Dr. Struve's ten years' labours relative to factitious mineral waters; he next discusses the nature of mineral waters in a physical, chemical, and medical point of view; enumerates the diseases in which their employment is indicated, and terminates with some general instructions for their internal use.

* A few months since, this oil was advertised for sale, under the name of *Oil of Winter Green*, by Mr. Roberts, Drug-broker, of Jeffrey's Square, St. Mary Axe.

APOTHECARIES' HALL.

PRIZE QUESTIONS.

BOTANY.

Examination Paper, August 3d, 1842.

HOURS FROM 11 A.M. TILL 9 P.M.

1. State the views of Liebig respecting the nutrition of plants.
2. State the uses of the leaves.
3. Describe the structure and uses of the bark, and mention instances in which the bark may be supposed to exercise the functions of leaves.
4. How do physiologists account for the ascending direction of the fruit of *Convolvulus sepium*, and for the descending direction of the fruit of *Conv. arvensis* and *C. major?*
5. Describe the structure of the pistil.
6. Describe the structure of the ovulum before and after fecundation.
7. Mention any cases in which it is necessary to examine the ovarium, in order to understand the nature of the ripe fruit.
8. Describe the structure of the fruit in Cucurbitaceæ.
9. Describe the structure and give examples of the following fruits, viz. :— achenium, folliculus, legumen, lomentum, caryopsis, pyxidium, bacca, pomum.
10. Describe the successive formation of parts in the fruit of Leguminosæ.
11. Define the following terms, viz. :—farinosus, lepidotus, ramentaceus, squamosus, paleaceus, nervosus, costatus, trinervis, triplinervis.
12. Give examples in proof of the theory of floral organs being derived from modifications of leaves.
13. Give the essential characters of the primary divisions of plants, according to natural affinities.
14. It is said that plants exhibit a corresponding agreement in structure and medicinal or chemical properties: are there any orders which offer an exception to this rule?
15. Give the essential characters of the following natural orders, and state the most important articles of the Materia Medica which are furnished by each order: Ranunculaceæ, Umbelliferæ, Cucurbitaceæ, Violaceæ, Euphorbiaceæ, Polygonaceæ, Scrophulariaceæ, Solanaceæ, Coniferæ, Melanthaceæ, Liliaceæ, Smilaceæ.
16. Describe, in Latin, the plants numbered 1 to 6: state their natural orders and probable sensible properties.

N. B. WARD.

*** The plants were—1. Alströmeria—2. Colutea cruenta—3. Cephalanthus occidentalis—4. Cissus orientalis—5. Combretum purpureum—6. Oncidium flexuosum.

DR. KANE'S ACCIDENT.

Several contradictory statements having appeared in the newspapers, respecting Dr. Kane's accident, whilst lecturing at the Mechanics' Institution, Liverpool, we subjoin the following account, which we have received from a Correspondent in Manchester:

"Dr. Kane was preparing some of the gas of marshes (and not olefiant, as stated in the papers), and having just had his attention directed to the derangement of his retort, was adjusting his apparatus, when the adapter of the retort was blown out, and some of the half-fused contents (a

mixture of caustic potash and acetate of potash, the temperature of which must have been not less than 600° Fah.) was thrown upon one of his hands; he immediately applied water, at the same time continuing to address his audience, forgetting that he was leaning over the open beak of the retort, from which the proto-carburet of hydrogen was issuing. In a few minutes he was observed to grow very pale, and to speak apparently with great effort, on seeing which Mr. Dircks stepped forward to his assistance; but, before the doctor could be led from the room, he had swooned. He has now, from accounts of his health lately received from Dublin, completely recovered from the effects of the accident."

DR. RYAN'S ACCIDENT.

On Friday, the 9th of August, Dr. Ryan was experimenting with chloride of nitrogen for the purpose of determining the laws which regulate its explosion. He exploded a small portion by allowing a weight to fall on a bottle containing it, which bottle was in contact with another filled with olive oil. The bottles being simultaneously broken, the contents came in contact and the explosion ensued. On repeating the experiment with a larger quantity of the chloride of nitrogen (half an ounce) the explosion did not occur as before, and after having waited about five minutes, he approached the apparatus to examine it. At that instant the explosion took place, and he was thrown back with such violence as to be deprived of sensation for a few minutes. On recovering himself, he discovered that his left arm was broken in such a manner as to leave no doubt that the weight had struck him, although at the time he was not conscious of the blow. The Doctor has nearly recovered from the effects of the accident, and has resumed his duties at the Polytechnic Institution: the accident occurred in Dr. Ryan's house at Islington, explosions being prohibited at the Institution.

Obituary.

MONS. PELLETIER.

This distinguished Pharmaceutist died on the nineteenth of July last, after a long illness. Pelletier was a member of the French Institute, of the Royal Academy of Medicine, of the Council of Health, an officer of the Legion of Honour, and Director of the School of Pharmacy.

ERRATA.

Page 50, line 8, from bottom, *for* (Dub. Ph. 919.4,) *read* (919).
Same page — 3, from bottom, last column, *for* 18, *read* 18.4.
Page 116, — 9, *for* cyapium, *read* cynapium.
Same page — 14, *for* (Chicorium *intybus*, Chicoraceæ), *read* (Cichorium *intybus*, Cichoraceæ).
Page 159, —23, from top, *for* (whatever be their concentration, or the heat applied), *read* (unless highly concentrated or heated).
Page 225, List of Members, *for* Bolton, Challiner, John, *read* Bolton Challinor, John.

TO CORRESPONDENTS.

"COLLEGA." Although the word is correctly spelt *cichoraceæ*, it is pronounced *chicoraceæ*, from the Italian.

"PRO BONO PUBLICO." The List of Duties contained in Vol. II. No. 2, corresponds in every particular with the tariff "officially compiled from authentic documents," published at 27, Poultry, and sold by GILBERT, Paternoster Row, of which upwards of seven thousand copies have been circulated. On again carefully revising it, and comparing it with a government copy, we find all the *new duties perfectly correct*, with one exception,

(After Crude Antimony and Regulus of Antimony, *for* ton, *read* cwt.)

In the left-hand column, which gives the old duties, the figures are all correct, but *the quantities to which the figures apply have been omitted*, as is the case in other versions of the tariff which we have seen. We regret that we have not been in this respect more explicit than others. As the PHARMACEUTICAL JOURNAL is intended as a work of reference, and perspicuity is, therefore, of the highest importance, we shall reprint the tariff, and stitch it up with our next number.

Mr. WILLIAM GOSLING is referred to our leading article.

Mr. FORDRED. *Quest.* 1. (Brandish.) See page 209. *Quest.* 2. What is the peculiarity in the preparation of Howard's Sodæ Sesquicarb. which prevents it from becoming lumpy? This is a question which we have no means of answering. *Quest.* 3. Would not Dr. Thomson's Hydrarg. Bichlorid. sell if it were re-sublimed into cakes? and, Would it not answer for Kyan's patent process? We have no doubt that it would sell, if transformed into the state in which it is usually met with in commerce, and it would, in its original form, answer extremely well for Kyan's process; but persons who are unacquainted with Chemistry, judge by appearances in cases of this kind, and thus often lose the advantage of a discovery by adhering to an old prejudice.

Mr. FORDRED suggests, that a few practical remarks on leeches would be acceptable.

"R. F., A.P.S." wishes us to insert a formula for Tinctura Secalis Cornuti Ætherea. We have not seen a published form, but the tincture has been prepared as follows:—

℞ Pulveris Secalis Cornuti, ℥ij.
Silicis (White Sand), ℥ij.
Ætheris Sulphurici, ℥ix.

Fiat Tinctura. This is done by percolation, the prod uct being eight ounces. The dose is from thirty minims to a drachm.

"AN ASSOCIATE IN THE CITY" is referred to the above.

The formula for Ætherial Tincture of Lobelia Inflata, which we published in Vol. I., No. 5, page 214, was taken from an article, by Mr. Charles Whitlaw, in the "Lancet," of 1836-7, Vol. II., page 372. We are not acquainted with any other formula.

Dr. Pereira gives a formula for Tincture of Belladonna, on the authority of Mr. Bailey, which is as follows:—

Belladonna leaves dried two ounces, Proof Spirit 16 ounces, macerate fourteen days and strain. Dose M. xx. to M. xl.

Associates are admitted to the Pharmaceutical evening meetings, and also to the evening lectures.

"SOCIUS." The following is the formula for Calcis Carbonas Præcipitatum in the Dublin Pharmacopœia. "Take of solution of muriatic of lime *five parts*, add to it as much (sub) carbonate of soda, dissolved in three times its weight of distilled water, as may be sufficient to precipitate the chalk, wash the precipitate three times in a sufficient qnantity of water, and dry it on a chalk stone or on bibulous paper." We cannot help thinking that any other number of parts would do as well as *five*.

"AN ASSOCIATE" (Manchester) complains of our answer to his enquiry for the *cheapest* way of making gallic acid—observing, that one of the objects of the Society is "to diffuse knowledge—to develope and encourage the talent of its members, and especially to impart information to those who live out of the reach of the Library and Lectures." In this we entirely agree; and had the enquiry related merely to the rationale of a process, we should have considered it within our province to insert an article on the subject. But it is the province of the *manufacturer* to study *economy*, and to adopt such means as his experience dictates, for meeting competition in the market, each party being probably ignorant of the precise method of manipulation employed by others, and taking care, for obvious reasons, not to divulge his own. We, therefore, think our correspondent will, on reflection, exonerate us from any intentional suppression of information.

"AN ASSOCIATE" (Lambeth). The theory of the process is adverted to in a paper by Mr. Burgess, Vol. I., No. 7, page 314.

"EXPLORATOR, M. P. S." enquires, "First, Whether there is a published translation of Victor Pasquier's Monographie du Madi? Secondly, Whether it is probable that the cultivation of the plant in this country would succeed?" First, We believe not. Secondly, There is no reason to doubt that the plant would grow in this country, but whether the *speculation* would answer, or not, is uncertain.

"AN ASSOCIATE" (Yeovil, Somerset) wishes to know which is the best formula for Dandriff, or Scurf, in the head; and whether it arises from a scrofulous habit? These questions being strictly medical, we could not presume to give an opinion.

"SOCIUS, A. P. S." (Cambridge). 51 is not the specific gravity of Acetic Acid, but its atomic weight, equivalent or combining proportion. Thus 51 parts by weight of anhydrous acetic acid combine with 32 parts (the equivalant or combining proportion) of soda, to form neutral acetate of soda, and this, with 54 parts (six times the equivalent or combining proportion) of water, forms 137 parts of crystallized acetate of soda. 137 is, therefore, said to be the atomic weight, or equivalent of this salt, and as 137 parts of it contain 51 acetic acid, 32 soda, and 54 water, 100 parts will contain 37.23 acetic acid, 23.37 soda, and 39.42 water. Hence the use of these several figures. The books alluded to are noticed in our last number.

"N. E. R." wishes to know how to judge of the term "idoneam crassitudinem," in preparing oxymel scillæ, linimentum æruginis, &c.—The oxymels should be about the consistence of syrups, which are prepared in the proportion of about two pounds of sugar to one pound of water. It is difficult to describe in writing the consistence of honey, or substances of that kind.

Mr. EARLAND. Mr. Redwood's Lecture will, most likely, be in our next number.

"B." suggests, that duplicates of books and specimens might be sent from Bloomsbury Square to the country, to form the nuclei of branch libraries and museums. When we have a sufficient supply it may be desirable to entertain the subject; at present, however, we have very few duplicates.

Mr. C. SETCHFIELD enquires, What advantages the Library affords to Associates in the country? This subject was alluded to in Vol. I., No. III., page 86. We may observe, in addition, that Associates in the country occasionally avail themselves of the Library, by writing to the Librarian, or the Editor, requesting reference to be made to authorities on various subjects.

"C. R." observes, with reference to Mr. Setchfield's remarks on disulphate of quina (page 170), that this salt is sometimes adulterated with ammonia, which occasions a precipitate when sulphuric acid is added.

"W. J. G., M.P.S.," has been applied to for crystallized sub-carbonate of magnesia, which was said to have been had in the form of semi-transparent crystals. He wishes to know, what salt was most probably alluded to?

We imagine the bicarbonate must have been the salt intended. This is deposited in bottles containing the fluid magnesia. It is not used as a medicine, being insoluble even in boiling water, as stated, by Dr. Davy, in a paper on the subject, published about a year ago in one of the Edinburgh Journals.

"PHARMACOPOLA" wishes to know, "Whether dispensers are justified in using Kiddle's James's powder, where *Pulvis Jacobi verus* is prescribed?"—Not having had an opportunity of testing the efficacy of the powder, we cannot give a positive opinion: we may, however, observe, that the price of James's powder is no criterion of its quality, it being sold at its present high rate by the other makers more from *choice* than *necessity*. PHARMACOPOLA observes, in reference to concentrated camphor julep, that myrrh facilitates the solution of camphor in water. We are aware of the fact, but this does not justify its addition to camphor julep.

"E. A." Iodide of potassium is the correct name (according to present authorities) for the salt which was formerly called hydriodate of potash.

"IOTA" (Kidderminster). We think Turner's Chemistry better than the other for a beginner. The price of Selecta è Prescriptis is 5*s*.

"AN ASSOCIATE, Leominster." Dr. Lindley's "Flora Medica" (price 18*s*.) and his "Elements" (price 10*s*. 6*d*.) are the works which we have chiefly recommended.

"Z. Z. Z." Berthollet's "Art of Dyeing," is, we believe, the best work on the subject. It has been translated into English, by Dr. Ure. 2 vols. 8vo. We recommend Blaine's "Outlines of the Veterinary Art." 8vo, fifth edition, 1841. Price £1 1*s*.

W. G. We shall announce Dr. Thomson's Dispensatory as soon as we receive the particulars.

"W. H." We cannot approve of the formula for lemonade, containing alum, sweet spirits of nitre, &c. &c.

"AN ASSOCIATE," Rochdale, is referred to Vol. I., No. 7, p. 349–351.

"W. B., M. P. S.," is referred to page 177 of this Number; also to pages 117, 118, and 166 of last Number.

"R. M. G., A. P. S.," is referred to page 177.

"A MEMBER," Newbury. No. Members and Associates are only entitled to the Journals for the year for which they subscribe.

"L. R.," "W. S. A.," "L. P. B.," are referred to our last number, page 171.

"L. P. B.," being already an Associate, is entitled to all the privileges of Associates, notwithstanding the circumstances which he mentions. See the last number, page 171—this number, page 177.

"H. W." We think our Correspondent was justified in the course he pursued. Opinions, however, differ on the subject, and it is always desirable to act on the safe side.

Mr. JOSEPH LEARY, of Birmingham, has forwarded for our perusal a letter from a correspondent, Mr. Sanford, in Rio de Janeiro, who wishes to become a member of the Pharmaceutical Society, and proposes to assist in carrying on scientific correspondence. Mr. Sanford states, that all Apothecaries (or Dispensing Chemists), in Brazil, are obliged to pass an examination, and encloses the names of the Examiners and Lecturers on Pharmacy at Rio.

We have received papers from Mr. Tyson and Mr. Bland, which we are obliged to defer until next month.

Advertisements to be addressed to Mr. CHURCHILL, 46, Princes Street, Soho.

Other Communications to the EDITOR, 338, Oxford Street (before the 20th of the month, if answers be desired in the ensuing number).

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	Phillips, W. B., 101, ditto
	Ranney, H. S., 259, High Street
	*Tanner, Nicholas Wm., 246, High Street
	Tozer, Richard, South Street
	*Trix, John, 26, High Street (*Life Member*)
	*Visick, Robert Goodyear, 224, High Street (*Life Member*)
Exmouth . . .	Thornton, Samuel
	Salter
Eye, Suffolk . .	*Bishop, Robert, Broad Street
Falkingham . .	*Ward, James, Market Place
Falmouth . . .	Passmore, James
Fareham . .	Batchelor, Charles
Farringdon . .	Ballard, Edwin
Farnham . . .	*Portello, W. F., Borough
Farnsfield . . .	Smith, Thomas
Farnworth . . .	Warburton, James
Feversham . . .	Buss, Thomas
Folkestone . . .	Filmore, John Francis
Framlingham . .	Clutter, Henry
Frampton on Severn	Roberts, Charles
Frome, Somerset .	Brand, William Curtis, Market Place
	Coles, Thomas Gear, Cork Street
	*Langford, Wm., *Secretary*, Bath Street
Gainsborough . .	*Marshall, John Ferris
Glasgow . . .	Hamilton, James
Glossop	Wreaks, Thomas Peacock
Gloucester . . .	Coleman, Edmund, *Secretary*,
	Eastgate Street
	*Fouracre, Robert, The Cross

Gloucester . . .	Pearce, Thomas, Westgate Street
	*Prosser, Charles, Westgate Street
	Sanders, Henry Wootter, Southgate St.
	Tucker, James, Northgate Street
Godalming . . .	*Moscrop, Edward Henry, High Street
Goole	Chantry, George
Gosport	Hall, John James, North Cross Street
	Tubbs, Charles F., High Street
Grantham . . .	Briggs, Richard
	Gamble, Richard
	Thompson, Edward
Gravesend . . .	Reid, Alexander, 83, High Street
Great Marlow .	Footit, Robert
Greenock . . .	Campbell, Samuel
Greenwich . . .	*Baker, Edward H.
	*Kelland, Richard, *Secretary*
Guildford . . .	Emlyn, William Olliff
	Leggatt, George
	Martin, Edward Waller, *Secretary*
Guisborough . .	*Duck, Daniel
Hadleigh . . .	*Wick, James
Halifax	*Denton, Thomas, *Secretary*, 14, Old Market
	*Jennings, William, 6, North Gate
	*Jepson, William, 6, Silver Street
	*Lofthouse, James, 1, Corn Market
	*Parker, John Crabtree, 14, Crown Street
	*Parker, Thomas, 19, Old Market
	Parrott, William, 6, Silver Street
	*Stott, William, Sowerby Bridge
	*Suter, Alexander Grylls, 7, Old Market and 29, Crown Street
Halesworth . .	Reynolds, William
Halsted	*Paul, H.
Hammersmith . .	Adams, Francis
	Inglish, James William
Hampstead . . .	*Gallard, William
	Stephenson, William Allen
Hampton. . . .	Benbow, George Henry
Hanley, Stafford	*Jones, Charles, *Secretary*, Market Square
	Yates, William Henry, Lamb Street
Harleston . . .	Muskett, James
Harrowgate . .	Waite, William
Hartlepool . .	*Horner, Stephen, *Secretary*, High Street
	Jackson, W. G., Northgate Street

Hartlepool . . .	*Paddon, Robert, Market Place
Haslingden . .	Falshaw, Thomas T.
Hastings . . .	Amoore, Charles, 11, Castle Street
	Lea, Henry C., 66, High Street
	Mason, William, *Secretary*, High Street
	Stubbs, Eli West, 20, George Street
Haverhill . . .	Kitching, Charles
Hickmondwicke .	Booth, John
Hemel Hempsted	Evans, John
Henley-on-Thames	*Kinch, Charles, Market Place
Henley in Arden .	Hopkins, W. F.
Hertford . . .	*Lines, George, Market Place
Hereford . . .	Draper, C. E., Broad Street
	Duggan, Henry Stephens, Broad Street
	Jennings, Reginald, High Town
	*Weston, S. A., *Secretary*, High Town
Heywood . . .	Jameson, John Bland
Hitchin, Herts .	Chippenfield, Robert, Sun Street
	Ransom, Joseph, Sun Street
Hogsthorpe, Lincoln	Walker, Charles
Holt, Norfolk .	Craske, Samuel
	Drozier, Edward, *Secretary*
Holywell . . .	Turner, F.
Honiton	*Rogers, William
Horncastle . . .	*Caparn, Daniel, High Street
	Holdsworth, Mark
	Parker, Daniel
	*Whitton, George, *Secretary*, High Street
Horsham . . .	Snelling, Francis
Hounslow . . .	Ward, J. C.
Howden, Yorkshire	Wainwright, J.
Huddersfield . .	Hall, George
	Jones, Edmund
	Wrigley, Charles James
Hull	*Baynes, James, *Secretary*, 28, Waterwork Street
	*Broomhead, Wm., 5, Prospect Street
	Burton, John, Lowgate
	Burton, Thomas, Mytongate
	Carlton, William Preston, Market Place
	Chapman, Edward, Queen Street
	Collinson, Samuel, Queen Street
	Fisher, Samuel, Bridge Street
	Fullam, James, Myton Place
	*Garton, Henry, 32, Whitefriargate

Hull	Graves, Henry, Waterhouse Lane
	Hattersley, John, Market Place, Barton
	Hay, William B., Mytongate
	Kirkus, Thomas, Salthouse Lane
	Kirkus, Richard R., Sykes Street
	Kirton, Joseph B., Saville Street
	Lester, Thomas, Dock Office Row
	*Lofthouse, John, 15, Market Place
	Melson, John, Mytongate
	Robinson, Charles L,, Market Place
Hungerford . .	Keen, Benjamin
Huntingdon . .	Mann, Robert, *Secretary*
	Provost, Thomas Pullen
Hyde	Brocklehurst, James
Ilfracombe . . .	Thomas, Thomas
Ipswich	Cook, Arthur Bott, *Secretary*, Brook Street
	Cornell, Philip James, Tavern Street
	Eyre, Alfred Benjamin, Tacket Street
	Fitch, Wm. Stephenson, Butter Market
	Harmer, John Dalton, Northgate Street
	Ransome, George, ditto
Ironbridge, Salop	Baylis, Thomas
Kendal	Hudson, Richard, Highgate
	*Marriott, Wilson, *Secretary*, Stricklandgate
Kettering . . .	*Wright, John Alfred, Market Place
Kidderminster .	Court, John, Vicar Street
	*Steward, Josiah, *Secretary*, Bull Ring
	*Steward, Theophilus, Bull Ring
Kingston-on-Thames . . .	*Jones, W. B., Market Place
Kirkaldy . . .	Dron, William
Knaresboro' . .	*Acomb, J., Market Place
Knottingley . .	Greaves, William
Knutsford . . .	Sylvester, J.
Lancaster . . .	Aldren, John
	Whimpray, John
	Wilson, Edward
Lane End, Potteries, Stafford.	Abraham, A.
Launceston . . .	Eyre, Thomas Symes
	Spettigue, John
Leamington . .	*Brierly, J. W., 22, Regent Street
	*Colbeck, George R., 23, Lower Parade
	*Davis, Henry, 19, Warwick Street

LEAMINGTON . .	*Flecknoe, Josiah, 115, Warwick Street
	Harper, Henry, York Terrace
	*Pearce, Percival, 4, Upper Parade
	*White, Henry, 3, *Secretary*, Lower Parade
LEDBURY	Rogers, John
LEEDS . . .	*Bell, Henry, Hunslet Lane
	*Bell, William, D., Kirkgate
	*Brook, John, Boar Lane (*Life Member*)
	Clapham, John K., Briggate
	*Crawshaw, Henry, 103, West Street
	*Garland, Thomas, Call Lane
	*Harvey, Thomas, Briggate
	Helliwell, Daniel
	Ingur, Henry
	Land, John, Briggate
	*Metcalf, J. C., Lady Lane
	*Ramskill, Parson, Meadow Lane
	*Reinhardt, George, 76, Briggate
	*Reinhardt, William, 76, Briggate
	*Rhodes, Frederick, Upper Head Row
	*Smeeton, Edward, *Secretary*, Boar Lane (*Life Member*)
	*Smith, Samuel, Meadow Lane
	*Staveley, M., West Street
	*Staveley, Thomas Beal, East Street
	*Swann, William, Meadow Lane
	Townsend, John Henry, Commercial St.
	*Worrall, Thomas W., Wade Lane
LEES	Buckley, John
LEICESTER . . .	Carr, William, St. George's Street
	*Cooper, Thos., *Secretary*, Market Place
	Goddard, Joseph, Gallowtree Gate
	Nettleship, Henry, Market Place
	Parsons, Thomas, Gallowtree Gate
	Pickering, Henry, Highcross Street
	Teear, John Manshaw, Humberstone Gate
LEIGHTON BUZZARD	Readman, William
	Richmond, Robert
LEOMINSTER . . .	*Davis, Francis, *Secretary*, High Street
	*Gilkes, William, Draper's Lane
LEWES	Davey, Joseph, 178, High Street
	Figg, Thomas, Cliff
	Head, John, 31, High Street
	Pain, Albert, 59, High Street
	Saxby, Henry, 57, High Street

LEWISHAM, KENT .	Greensill, Edward
	Lavers, Thomas H.
	Sells, Robert
LICHFIELD . . .	*Morris, Rupert, Market Street
LINCOLN	Battle, John Richard, High Street
	Nettleship, Thomas, *Secretary*, 191, High Street
LISKEARD . . .	Eliot, S.
	Lawrence, Thomas Hodge
LIVERPOOL . . .	*Aspinall, George, 135, St. James's Street
	*Ball, Joseph, 1, West Derby Street
	*Blake, John, *Secretary*, 18, Bold Street
	*Cartar, William, 8, Bold Street
	*Clay, Robert, 104, Bold Street
	*Coupland, Henry, 1, London Road
	*Ellison, John, 73, Church Street
	*Evans, Richard, 22, Lower Pitt Street
	Evans, Edward, Lord Street
	Evans, Thomas Bickerton, Lord Street
	Eyre, Thomas, 20, Seel Street
	Fergusson, John, Pownall Square
	*Fidler, Robert, 53, Northumberland Street
	*Fisher, William, 64, Bold Street
	*Heath, Augustus Edw., 1, London Road
	Hughes, John Jones, Warwick Street
	Hume, Henry, Prescott St. Scotland Road
	*Johnson, John Harrison, 7, Church Street
	*Johnson, Sam., Church St. (*Life Member*)
	Jones, William, Berry Street
	*King, Wm Waudby, 1, William Henry St.
	*Lathbury, Robert, 39, Castle Street
	*Lowe, Thomas, Islington
	Nuttall, James, Richmond Row
	Owen, James, London Road
	Parkinson, Thomas, Scotland Road
	Phillips, Joseph Brooks, Lower Brook Str.
	*Priestly, John, 52, Lord Street
	*Proctor, William, Ranelagh Street
	*Rawle, John, 17, Church Street
	Rawson, George, 82, New Scotland Road
	Rowland, B. C., 1, Great Homer Street
	Shaw, Charles Knight, 2, Russell Street
	Simon, John, Lime Street
	*Sykes, Frederick Buttery, 14, Upper Parliament Street

Liverpool . . .	*Thompson, Thomas, Church Street
	*Tiernan, Edward, 185, London Road
	*Tinker, Edward, 5, Scotland Road
	*Titherington, Tho. Ackers, 30, Oxford St.
	*Wagstaff, Wm., 42, Great George Street
	Williams, John Wm., 55, Tythe Barn Str.
Llandillo . . .	Morgan, Benjamin
	Williams, John
Loddon, Norfolk .	Blanchflower, T. C.

LONDON.

Adams, Alfred . . .	122, Piccadilly
*Addison, Jno. Christ. .	25, Princes Street, Soho
*Alger, Robert . . .	38, High Street, Kensington
*Allan, D.	10, Freeschool Street, Horsleydown
*Allen, William, F.R.S.	2, Plough Court
*Allen, William . . .	2, Morgan's Place, Liverpool Road, Islington
*Alsop, Robert . . .	15, Sloane Square, Chelsea
Anderson, Charles . .	Belgrave Street, Pimlico
Anderson, William . .	178, Tooley Street, Borough
Appleton, Thomas Cass	45, Curzon Street, May Fair
*Austin, Henry . . .	161, Bermondsey Street
*Baiss, James	125, Lower Thames Street
*Baiss, William Arnold .	126, Lower Thames Street
*Baker, Wm. Joseph .	14, Cornwall Crescent, Camden Town
*Balmer, John . . .	82, St. John's Street Road
*Barber, Thomas A. .	Islington
Barber, Joseph . . .	7, Orange Street, Red Lion Square
*Barraud, Charles Fred.	Union Row, Camberwell
*Barron, Charles . .	6, Giltspur Street
*Barry, John Thomas .	Plough Court
Bartleman, George . .	74, Westbourne Street, Eaton Square
*Bartlett, William . .	1, Brettin Terrace, King's Road, Chelsea
Barton, Robert Dodge .	68, Fleet Street
Bass, William Thomas .	Hornsey Road, Islington
*Bass, James	78, Hatton Garden
Bateman, John . . .	8, Castle Street, Leicester Square
Bates, John J. . . .	Dover Road
*Battley, Richard . .	32, Lower Whitecross Street

*Baxter, George . . .	144, High Holborn
*Bayley, Edmund . .	12, Aldgate High Street
Beaton, John . . .	261, Oxford Street
*Beatson, Steph. Lowdell	18, Thornton Street, Horselydown
*Bell, Frederick John .	338, Oxford Street
*Bell, Jacob	Ditto
*Bell, John	Ditto
Bennett, Frederick . .	85, Goswell Road
*Bentley, Edward . .	41, Moorgate Street
Bentley, William . .	11, Mount Street, Friars' Mount, Bethnal Green
*Best, John Dear. . .	14, Grosvenor Street, West
*Bigg, Thomas . . .	15, Crawford Street, Portman Square
*Bilton, George . . .	68, Three Colts' Street, Limehouse
Binge, Thomas . . .	York Street, Westminster
Binnington, S. . . .	Haymarket
*Bird, William Lionel .	Castle Street, Oxford Street
*Blake, Alexander . .	47, Piccadilly
*Blandford, J. F. . .	97, Charlotte Street, Fitzroy Square
Bland, John	57, Penton Street
Blount, William . .	Cheyne Walk, Chelsea
Bolton, Joseph . . .	1, Strachan Terrace, Islington
Bolton, Wm. Treacher.	12, Wells Row, Islington
Bond, Henry . . .	11, Cross Street, Plumber's Street, City Road
Bossy, Alfred Horsley	4, Brunswick Place, Stoke Newington
Bostock, Robert . . .	High Street, Clapham
Botwright, John Roper	2, Trinity Row, Islington
Boully, Peter . . .	Grove Terrace, Queen's Road, Bayswater
Bowden, Edward . .	Charles Street, St. James's Square
Bradley, John . . .	Pont Street, Belgrave Square
Bridge, Thomas . . .	*a.* 270, Regent Circus
*Briggs, Edwin . . .	48, Wigmore Street
Broad, John	25, Bedford Row
*Bromfield, Samuel . .	237, Tottenham Court Road
Brown, J.	Commercial Road
*Brown, William . . .	154, Sloane Street, Chelsea
Buck, Thomas . . .	Kingsland Green
*Bullock, Lloyd . . .	22, Conduit Street
Burcham, Robert Partridge	13, Albany Street, Regent's Park
*Burfield, Henry . . .	180, Strand
Burgess, Alfred . . .	20, New Street, Dorset Square
*Butler, Thomas . . .	4, Cheapside (*Life Member*)
Byles, James Hodge .	86, Hackney Road
Campbell, William . .	57, Great Coram Street, Russell Sq.

*Carne, John	55, Brompton Row
Chapman, John . . .	7, High Street, Islington
Chase, Thomas . . .	14, Holborn
Chandler, William . .	95, Minories
*Cheese, James . . .	Earl Street, Finsbury
Churchill, Chas. Stephen	44, Strutton Ground, Westminster
Churchyard, Isaac . .	24, Park Terrace, Regent's Park
*Cobb, R. C.	3, Tavistock Square
*Cocking, Thomas . .	19, Great Portland Street
*Cole, John	101, High Holborn
Coles, John	Clifton House, Camberwell New Rd.
*Colk, George . . .	29, Fleet Street
Collings, James . . .	2, Brook Street, Bond Street
Collins, . . .	123, High Street, Camden Town
*Compton, Charles . .	14, Brewer Street, Golden Square
*Constance, William .	5, Hanover Place, Regent's Park
*Cooke, Charles G. . .	31, Southampton St., Covent Garden
Cooper, John . . .	Bow
*Coulson, Robert . .	14, Edward Street, Portman Square
Court, William Grimes	282, Regent Street
*Crook, George . . .	63, Great Marylebone Street
*Croucher, John . . .	223, High Street, Shadwell
*Croyden, Charles . .	37, Wigmore Street
Cullen, William . . .	37, Bedford Row, Walworth Road
Dakin, Joseph . . .	248, High Street, Poplar
*Dakin, Thomas . . .	78, King William Street, City
Davenport, John T. .	33, Great Russell Street, Bloomsbury
*Davies, Charles . . .	North Brixton
Davies, Edward Clement	High Street, Shoreditch
*Davies, Joseph . . .	27, Aldgate
Davis, Christopher Hen.	9, Acton Place, Bagnigge Wells Rd.
Davis, Samuel Forbes .	215, Oxford Street
*Davy, Charles . . .	100, Upper Thames Street
*Day, Samuel	6, Store Street, Bedford Square
*Deane, Henry . . .	Clapham
*Dear, Richard Edward	89, Bishopsgate Street Within
Dexter, James . . .	2, Queen's Row, Pimlico
*Dickins, Richard . .	80, Holborn Bridge
*Dinneford, Charles . .	172, Bond Street
Dinsdale, Henry Early	148, Holborn Bars
Dordoy, Stephen George	38, Blackman Street
Doughty, E. Davidson	4, William Street, Knightsbridge
*Down, John	7, Coburg Place, Bayswater
*Drew, James . . .	Bush Lane
*Eddy, Charles W. . .	30, Crown Street,
Edmonds Thomas . .	Cross Street, Blackfriars' Road

*Edwards, Charles . .	63, Great Russell Street, Bloomsbury
*Edwards, Joseph . .	12, New Cavendish Str. Portland Pl.
Edwards, William . .	14, Goodge St., Middlesex Hospital
Edwards, William . .	29, King William St., London Bridge
*Elam, Benjamin . . .	196, Oxford Street
Elkington, Henry . .	132, Edgeware Road
Elliott, John	Northumberland Pl., Commercial Rd.
*Ellis, John	225, Upper Thames Street
Emery, Fred. Arthur .	Notting Hill
*Evans, John	60, Bartholomew Close
*Farmar, Robert A. . .	40, Mount Street, Lambeth
*Faulconer, Robt. Steph.	Keen's Row, Walworth
*Field, Thomas R. . .	2, Wilderness Row
*Field, William . . .	27, Queen's Buildings, Brompton
*Fisher, Robert James .	76, New Bond Street
*Fisher, William Henry	18, Conduit Street, Bond Street
Forster, Nicholas . .	105, Holborn Hill
*Forster, Thos. Holland .	11, King's Road, Chelsea
Foster, Thomas William	3, Old Broad Street
*Foulger, Samuel . .	133, Ratcliffe Highway
*Fowler, Richard . . .	14, Brewer Street, Golden Square
*Fowler, John . . .	35, Bedford Street, Covent Garden
*Fox, William	48, Church Street, Bethnal Green
Frackleton, William .	Acre Lane, Brixton
*Freeman, John . . .	13, Blackfriars' Road
French, James . . .	Norton Folgate
*Fuller, Thomas G. . .	54, Whitechapel High Street
Gale, Henry	27, Judd Place West, New Road
Gale, John	Kentish Town
*Gale, Samuel . . .	27, Judd Place West, New Road
*Galliers, George . . .	221, Tottenham Court Road
*Garden, Alexander . .	372, Oxford Street
*Garle, John	12, Kensington Terrace, Gravel Pits
*Garva, J.	Clapton
*Gifford, Joseph . . .	104, Strand
Glover, George . . .	Goodge Street
*Gloyne, C. G. . . .	5, Terrace, Kensington (*Life Memb.*)
Goddard, John Donald	68, Hatton Garden
Goodbarne, Thomas .	Charles Place, Hoxton
Goodwin, James . .	7, North Audley Street
Goodwin, John Robert	38, Blackman Street, Borough
Gosling, W. . . .	Brompton
*Grace, John F. . . .	8, Grafton Street, Fitzroy Square
*Greaves, Edward Russel	85, Goswell Street Road
*Green, Samuel . . .	1, Harleyford Place, Kennington
*Green, William Frost .	42, Whitechapel Road

Greenhalgh, James H. .	18, Smithfield Bars
Grieve, John	1, John Street, Limehouse Fields
Griffiths, Thomas . .	10, Everett Street, Brunswick Square
Griffiths, John . . .	41, Clerkenwell Green
*Grignon, Peter . . .	174, Regent Street
*Grindle, George . .	122, Pall Mall
Grisdale, John Maw .	216, Tottenham Court Road
Grounds, Thomas . .	Church Street, Hackney
*Gunton, Walter Gabriel Basset	New Weston Street, Southwark
*Hallows, Wm. Ayscough	2, Clark's Place, Islington
*Hanbury, Cornelius .	2, Plough Court
*Hanbury, Daniel Bell .	Ditto
*Hancock, Thos. James .	Earl Street, Finsbury
Harrold, William . .	Hackney
*Hawxby, Thomas . .	37, Berners Street
*Haynes, Robert . . .	35, Piccadilly
Heathfield, William E.	Princes Square, Finsbury
Henly, John Creed . .	213, Upper Thames Street
*Herring, Thomas . .	40, Aldersgate Street
*Herring, Edward . .	40, Aldersgate Street
*Herring, William . .	40, Aldersgate Street
Heudebourck, John L. .	Hackney
Hewitt, John . . .	Wells Street, Wellclose Square
Hewlett, Chas. James .	68, Hatton Garden
*Heyward, Richard . .	Bush Lane
Hibon, John . . .	Down Street, Piccadilly
Higgins, Joseph Slatterie	185, Church Street, Shoreditch
Hill, Arthur Stephen .	Little Britain
Hill, Townley . . .	60, Leadenhall Street
*Hockin, Charles . . .	38, Duke Street, Manchester Square
*Hodgkinson, John . .	213, Upper Thames Street
Hodgson, Chas. James	2, Park Lane, Piccadilly
Hodgson, Philip Brown	60, Strand
Hogg, Robert . . .	Borough
*Hooker, Thomas . .	Millpond-street, Bermondsey
*Hooper, Bartlett . .	43, King William St., London Bridge
Hooper, Charles . .	4, Little Ormond Street
*Hooper, William . .	24, Gt Russell Street, Covent Garden
*Hooper, Hugh H. . .	22, Commercial Place, North Brixton
Hooper, William . .	7, Pall Mall, East
*Horner, Edward . . .	20, Bucklersbury
*Horner, James Thomas	Ditto
Houghton, William .	Brixton Hill
Howard, Robert . .	Stratford-le-Bow
Howse, William . . .	16, Titchborne Street

Hucklebridge, James M.	103, Upper Ebury Street
*Hudson, William Banks	27, Haymarket
Hughes, Rowland . .	Kent Road
*Hulse, Richard . . .	37, Leadenhall Street
Humpage, Benjamin .	51, Judd Street, Brunswick Square
Hunt, Henry . . .	1, St. George's Terrace, Islington
Huntsman, Charles .	309, High Holborn
Huntsman, Robert .	47, High Street, Camden Town
*Huskisson, William .	12, Swinton Street, Gray's Inn Road (*Life Member*)
Huskisson, John . .	12, Swinton Street, Gray's Inn Road
*Huxtable, Thomas . .	104, St. John's Street, Clerkenwell
*Ince, William . . .	31, Southampton Str. Covent Garden
*Jackson, John . . .	47, Southampton Row, Bloomsbury
Jackson, William . .	93, Cheapside
Jallands, William . .	8, New Chapel Place, Kentish Town
Jamieson, John . . .	16, Amwell Street, Claremont Square
Jarvis, James Sanford .	High Street, Peckham
Jeanes, Francis Henry .	9, Broughton Place, Hackney Road
Jeynes, George . . .	Great James Street, Lisson Grove
*Johns, George Edward	42, Upper Albany Street.
Johnson, John . . .	116, Upper Street, Islington
*Johnson, Robert . .	17, East Street, Red Lion Square
Johnson, William . .	254, High Street, Borough
Jones, Peter	11, Norton Folgate
*Jones, Edward . . .	171, High Holborn
Jones, William . . .	34, Tavistock Place, Tavistock Square
*Jones, Sidney . . .	49, Davies Street, Berkeley Square
*Keating, Thomas . .	79, St. Paul's Churchyard
Kemp, Robert . . .	2, Queen's Place, Holloway
Kemp, Richard . . .	2, Trinity Row, Islington
*Kent, Thomas . . .	226, Blackfriars' Road
King, W. S. . . .	Edward Terrace, Kensington
Kingsland, George . .	22, King Street, Covent Garden
Lamplough, Henry . .	Islington Green
Langton, Fred. Chas. R.	226, Upper Thames St. (*Life Memb.*)
Leare, James . . .	Peckham
*Lescher, Joseph Sidney	60, Bartholomew Close
Lewis, William . . .	21, Paddington Street
Lewis, George . . .	33, Leicester Square
*Lightfoot, William . .	18, Finch Lane, Cornhill
*Linder, Charles . . .	104, Strand
*Lloyd, Frederick Rugge	Highgate
*Lowden, John Dawson .	Fleet Street
Lowe, William . . .	47, Blackfriars' Road
Lucas, Thomas . . .	125, Aldersgate Street

*Lucombe, Chas. C. .	86, Snow Hill (*Life Member*)
*Lum, Aubrey . . .	55, Fore Street, City
Mackinlay, Geo. Henry	52, Edgeware Road
*Macmurdo, Edward .	100, Upper Thames Street
Maine, Augustus . .	41, Blackman Street, Borough
Matland, Collier . .	54, Crawford-street
*Maitland, John . . .	5, Little Sussex Place, Hyde Park
*March, Thomas E. . .	326, Holborn
Martin, Benjamin . .	21, Charlotte Street, Fitzroy Square
*May, John	Battersea
*Mayhew, Saml. Martin	15, High Street, Camberwell Green
*M'Culloch, William .	95, Bishopsgate Street
Meggeson, George .	61, Cannon Street
*Mellin, H. F. . . .	44, Great Prescott Street
*Metcalfe, William . .	5, Old Fish Street
Millen, Stephen Robert	70, Shoe Lane, Fleet Street
Monkhouse, Edward .	Hawley Terrace, Camden Town
Moody, James . . .	24, Church Street, Camberwell
*Moore, Thomas . . .	136, New Bond Street
*Moore, James . . .	136, New Bond Street
Morris, John	High Street, Kensington
*Morson, Thomas . .	19, Southampton Row (*Life Memb.*)
Moxon, James Parnell .	Bush Lane, Cannon Street
Mussell, George . .	Camberwell
*Nash, Charles . . .	48, Great Marylebone Street
Newman, Richard C. .	21, Red Cross Street
Nettleship, Edward .	24, Queen Street, Mayfair
Noakes, Horace . .	87, Snow Hill
Noakes, Simpson . .	Ditto
*Novis, Thomas . . .	60, George Street, Portman Square
Oakley, G. W. . . .	38, Lamb Street, Spitalfields
*Orridge, William . .	97, High Street, Marylebone
Owthwaite, George .	30, Marchmont Street
*Owen, Henry . . .	52, Marchmont Street
Palmer, Robert . . .	25, St. George's Place, Knightsbridge
Palmer Thomas Walter	32, Newgate Street
Parsons, N.	York Street, Westminster
Parsons, Thos. Fulham	125, Edgeware Road
Paternoster, George .	7, Windsor Place, Old Kent Road
*Paulson, Eliezer . .	88, Chancery Lane
*Payne, Charles James .	5, St. Martin's Court, Leicester Square
*Pedler, George S. . .	199, Fleet Street
*Pegler, Arthur . . .	20, Portman Street
Pegler, Frederick . .	38, Ebury Street, Pimlico
Penrose, Arthur W. .	7, Amwell Street
Perkins, Benjamin . .	147, Oxford Street

Philpot, Henry . . .	32, Praed Street, Paddington
Phillipson, M. L. . .	22, Ludgate Hill
*Pigeon, Rich. Hotham .	31, Throgmorton Street
*Pigeon, jun., R. Hotham	Ditto
Pimm, George . . .	Walworth
*Pollock, Thomas . .	129, Fenchurch Street
Potts, Robert Ullock ·	55, South Audley Street
*Pound, Matthew . .	198, Oxford Street
Preston, Joseph Thomas	94, Smithfield Bars
Prichard, . .	23, King Street, Westminster
*Rea, Edward . . .	115, Wardour Street
*Redwood, Theophilus .	7, Little Cadogan Place
Rees, J.	Stratford-le-Bow
Reynolds, George . .	271, Bethnal Green Road
Richards, Samuel A. .	7, Brett's Buildings, Camberwell
Richardson, Benjamin Fox	4, Park Terrace, Camden Town
Richardson, Samuel .	1, West Place, Islington Green
*Roe, John William . .	37, Red Lion Street, Holborn
Robinson, James . .	8, Store Street, Bedford Square
Robinson, Samuel . .	164, Piccadilly
Rogers, David . . .	Kingsland Green
*Rouse, Benjamin R. C.	Wellington Street, Borough
Rouse, Fred. Josh. . .	Ditto
*Rouse, Robert . .	1, Wigmore Street
*Rowland, Christopher R.	260, Tottenham Court Road
Sadler, Thomas . . .	85, Goswell Road
Sadler, T.	Norton Folgate
*Sainsbury, Samuel . .	177, Strand
Sapsworth, Charles . .	15, Clark's Place, Islington
*Savory, John . . .	136, New Bond Street
Sharwood, James Allen	55, Bishopsgate
Sheen, James Richmond	4, Bridge Street, Vauxhall
*Sheldon, John . . .	72, Euston Square
Shillitoe, William Maw	95, Bishopsgate Street
*Simkin, Edward . . .	2, New Cavendish Str. Portland Pl.
Simmonds, Joseph . .	Lambeth Walk
*Simon, George Phillips	18, Finch Lane, Cornhill
Simpson, George . .	1, Robson's Place, Kennington Road
Slipper, James . . .	87, Leather Lane
*Smith, Joseph . . .	29, Haymarket
*Snowdon, George W. .	2, Haymarket
Southwood, Thomas .	6, Woburn Buildings, Tavistock Sq.
*Spencer, Joseph . .	38, Lamb's Conduit Street
Spencer, George . .	30, Marchmont Street
Spice, William H. . .	38, Duke Street, Grosvenor Square
Spicer, Henry . .	14, Brighton Place, New Kent Road

*Squire, Peter . . .	277, Oxford Street (*Life Member*)
*Squire, William . . .	95, Bishopsgate Street
*Stamper, Ralph . . .	140, Leadenhall Street
*Starkie, James . . .	4, Strand
*Stead, Francis . . .	213, Upper Thames Street
*Steadman, John . . .	Walworth Road
Steer, Philip R. . . .	96, Oxford Street
Stevens, Henry . . .	High Street, Stoke Newington
*Stevens, William S. .	31, Regent Street
*Stirling, John Williamson	86, Whitechapel High Street
Stone, Charles . .	24, Garlick Hill
*Strange, James . . .	20, Queen's Row, Pimlico
*Swire, Roger . . .	14, Edgeware Road
Taylor, Henry . . .	10, Pall Mall
Tidman, Wm. Walter .	55, Bishopsgate Street
*Times, Henry George .	4, Thayer Street, Manchester Square
*Tippett, Benjamin . .	3, Sloane Street, Chelsea
*Toller, John	18, Conduit Street, Bond-street
*Tonge, George . . .	213, Upper Thames Street
*Tosswill, Chas. Speare	8, Torrington Place
Towerzey, Alfred . .	10, Glasshouse Street, Regent Street
Tuck, William . .	Mile End Road
Turner, Edward . . .	27, Coventry Street, Haymarket
Twinberrow, William .	2, Edward Street, Portman Square
*Wagstaff, J. H. . . .	17, Grove Road, North Brixton
*Walker, Thomas . .	48, Tooley Street
Walker, Alexander . .	10, Ireland Row, Mile End Road
Walker, Henry . . .	35, Skinner Street, Somers' Town
Ward, Henry Pilkington	44, Marshall Street, Golden Square
Ward, John	79, Bishopsgate Street
*Watson, Robert . . .	25, St. George's Place, Knightsbridge
*Watts, George F. . .	17, Strand
*Watts, John . . .	Edgeware Road
*Waugh, George . . .	177, Regent Street
*Waylat, Robert . . .	4, Pavement, Moorfields
Welch, Edward . . .	2, Flowers Buildings, Holloway
*Wells, William R. . .	31, London Street
Westwood, William H.	16, Newgate Street
*Wheaton, James . .	11, Sols' Row, Hampstead Road
Westwood, jun., Robert	16, Newgate Street
*White, John	228, Piccadilly
*White, Thomas . . .	24, Cornhill
*White, William . . .	8, Haymarket
*White, Daniel . .	19, Park Terrace, Regent's Park
Whitmore, John . .	128, Oxford Street
Wilkes, George . . .	Mile End Road

*Wilkinson, William	248, Strand
Williams,	Halkin Street, Belgrave Square
Wilson, Frederick	6, Sampson's Place, Grange Road, Bermondsey
*Winstanley, Edward	7, Poultry
*Winstanley, E. Newnham	7, Poultry
Wood, William	25, St. Mary Axe
Wood, John	11, Queen's Buildings, Knightsbridge
Woodrooffe, Thomas	12, Stanhope Terrace, Hyde Park
Wooldridge, John	19, Bath Place, New Road
Woolley, William	17, Regent St., Vauxhall Bridge Road
Worger, Thomas C.	29, Chiswell Street
Wrigglesworth, James	421, Strand
Wright, John	14, Edward Street, Portman Square
Wyman, John	Red Cross Street
*Yarde, Giles	28, Lamb's Conduit Street
Yate, Edward	171, Hoxton Old Town
Yates, Benjamin	Budge Row

Long Sutton	*Cropper, James
Louth, Lincolnsh.	Armitage, W.
	Hurst, John
Lymington	Peat, Edward
Lyndhurst	Short, William
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	Langford, Jun., William
Ludlow	Cocking, George, Bull Ring
	Foster, Edward, Castle Street
	Grieves, John Edward, Old Street
	Grounds, Ambrose, *Secretary*, High Street
	Marston, Richard, Broad Street
Luton, Beds.	*Jordan, John, George Street
	*Phillips, Wm., *Secretary*, Market Place
Lutterworth	Gulliver, Walker Job
Maidenhead	*Higgs, John, *Secretary*, High Street
	*Shackell, John Webb
Maidstone	Allen, W. B.
	*Argles, Henry, 66, High Street
	Buchanan, F. William, 68, Week Street
	Jull, Thomas, 17, Week Street
	*Knowles, Henry, 5, High Street
	*Mares, John, 66, High Street
	*Mares, John Henry, 66, High Street
	*Pittman, Edward T., 21, High Street

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*Smith, George, *Secretary*,
28, Gabriel's Hill
Wimble, Edward, Week Street
Wimble, Francis, Week Street
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MALVERN . . . *Smart, Benjamin, Bellevue Place
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*Barker, Robert, 1, Market Place
Barlow, John, Oldham Road
Birks, George Vausse, 81, Temple Street,
Rusholme Road
Bowker, William, Deansgate
Breary, Wm., Arthur, 6, Upper Brook St.
Broadhead, George, London Road
Brown, Thomas, Cheetham Hill
Butterworth, John, ditto
Cartman, William, Stretford Road
Cooke, John Leigh, 51, London Road
*Danson, George, *Treasurer*,
63, Piccadilly
*Darling, William, 41, Shudehill
Davis, Thomas, Deansgate
Day, John Odams, 75, Oxford Street
Dethick, Charles, 8, Derby Street
Goadsby, Thomas
Hallsworth, Thomas, 83, Chancery Lane
Holyoake, William, 18, Downing Street
Hopkinson, William, 70, Broughton Road
Howard, John, 151, Great Ancoat's Street
Ingham, Rich. Hargreaves, Market Street
*Jackson, Thomas, 4, Great Ducie Street
Jewsbury, Henry, 103, Market Street
Lessey, John, Piccadilly
Lett, W., 189, Goolden Place, Oxford St.
Lynch, James Rockliffe, Market Street
Mason, W., Wallis, Downing St., Ardwick
Mayson, Francis, Oxford Street
Moore, John, Bridge Street
*Mottershead, John, *President*,
3, Market Place
Mount, John, 41, Dale Street
Nielson, Francis Edmund, Ardwick Bridge
Owen, Henry, 32, Chester Street, Hulme
*Pickup, John, 43, Brook Street
Race, William, Oldham Road

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	Standring, Thomas, 1, Piccadilly
	Taylor, James, 17, Saville Street
	Taylor, Thomas Hibbert, 8, St. Ann's Sq.
	Ward, John D., 102, Ormond Street
	Watkinson, Thos. Dewhurst, Market Place
	Westmacott, Geo. Brazier, Market Street
	White, James Atkin, 17, Shude Hill
	Winder, Thomas, Ashley Lane
	Woodall, John, Deansgate
	*Woolley, James, *Secretary*, 58, King Street
	Wright, Charles, 219, Ebenezer Place, Oxford Street
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	Pickering, J., *Secretary*
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MARKET HARBRO' .	Higgs, John Seagrave
	*Shepard, William, *Secretary*, High Street
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MASHAM	Hawkin, John
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MELTON MOWBRAY .	Ellaby, John, *Secretary*
	Wing, Thomas Newton
MIDDLESBOROUGH .	Thompson, H.
MILTON ABBOT . .	Prout, Robert
MILTON, KENT . .	*Whelpton, John, High Street
MINEHEAD . . .	Bond, John
MITCHELL DEAN	Coleman, Thomas Bennett
MOLD	Birch, Thomas Edwards
MONMOUTH . . .	Dawe, Edward
	Spencer, William
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	Hibbert, Walker
	*Hunt, John Hawkins
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	*Caparn, William John, *Sec.*, Market Place
	Snow, James
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	Fielder, Thomas Wooldridge
	Hickman, J. F.
	Payne, George, *Secretary*
	Ryott, Robert Atkinson

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	*Bustin, George, 16, Sandhill
	*Challoner, E. Wilson, *Secretary*, 56, Grey Street
	*Colman, John, 6, Bridge Street, Gateshead
	*Fairweather, John, 69, Pilgrim Street
	*Garbutt, Cornelius, Bridge Str., Gateshead
	*Goodall, John, Stockbridge
	*Gibson, William, 15, Bigge Market
	*Gilpin, James, 69, Pilgrim Street
	*Headley, Henry Benson, Westgate Hill
	*Mather, Robert, 91, Pilgrim Street
	*Myers, John, Spital
	*Nichol, Anthony, 22, Quay
	*Proctor, William, 20, Dean Street
	*Ridley, Henry, Blackett Street
	*Ridley, Thomas, 20, Collingwood Street
	*Russell, Robert, 57, Groat Market
	*Swan, Walker, 8, Close
	*Tweddel, John, 12, Grainger Street
	*Walker, W. B., 97, Percy Street
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NEWNHAM, GLOSTER	Cook, Thomas
NEWPORT, I. W. .	Millidge, William Henry, High Street
	*Rogers, John, High Street
NEWPORT PAGNELL	Taylor, William
NEWPORT, SALOP .	Chalmers, Henry
NEWTOWN, MONTGOMERYSHIRE . .	Morgan, Richard
NORTHALLERTON .	Warrior, William
NORTHAMPTON . .	Armfield, George, Sheep Street
	Barry, George, Parade
	Greville, Henry Methold, Wood Hill
	Greville, Edwin, Wood Hill
	Harris, William, *Secretary*, Gold Street
	Jeyes, Philadelphus, Drapery
	Negus, Samuel, Gold Street
	Southam, George, Gold Street
NORTHWICH . . .	Blades, Sheriff
NORWICH . . .	*Arnold, Edward, Orford Hill
	*Bass, Robert, London Street
	*Case, Philip, Bridge Street, St. George's
	Cross, Charles, Saint Lawrence
	*Cubitt, George, *Secretary*, Upper Market

Norwich	*Grimmer, Samuel, White Lion Street
	Smith, Joseph de Carle, Magdalen Street
	*Rudd, John, St. Michael's Coslany
Nottingham . .	Beardsley, John, Sneinton Street
	Chapman, William, Friar Lane
	*Cheetham, Henry, *Secretary*, Long Row
	Coltman, John, Long Row
	Cox, Edward, London Road
	Gelsthorpe, William, Bridlesmith Gate
	*Hedderley, John, Clumber Street
	Humphrey, Matthew, Drury Hill
	*Large, Henry, Market Place
	*Potts, Richard, Goose Gate
	Ratcliff, Henry William, Long Row
	Wain, William, Lister Gate
	Williams, William, Long Row
Oakham, Rutlandshire . . .	Wellington, James Martin
Oldbury, Salop .	*Tonge, Charles
Oldham	Braddock, William, Market Place
	Brelsford, James, Market Place
	Cocks, George, Mumps
	Hargraves, James, High Street
	Wood, Eli, Greenacre's Moor
Ollerton . . .	Roe, Thomas
Oundle	Roper, Henry
Over	Singleton, Henry
Oxford	Brown, Henry, High Street
	Cousins, Thomas George, *Secretary*, Magdalen Street
	Hitchcock, Harry, High Street
	Miller, Charles, Queen Street
	Telfer, Frederick, Corn Market
Paignton, Devon .	Merson, William
Pendleton . . .	Gill, Samuel
Penrith	Burthwick, W. J.
Pershore . . .	Allen, Francis
Peterborough . .	Buckle, Christopher Francis
	*Parnell, John, *Secretary*, Market Place, *Life Member*
	Smith, John
	*Sturton, J., Bridge Street
Plymouth . . .	*Balkwill, Joseph Hancock, Old Town Str.
	*Balkwill, Charles, Old Town Street
	*Beer, Joseph, East Street
	*Cornish, John, 27, Whimple Street

PLYMOUTH . . .	Driscoll, Charles, Southside Street
	Frost, William, High Street
	Geldard, Richard Kelly, Exeter Street
	*Gibbons, William, Treville Street
	Hallett, John, East Street
	*Lewin, William, Whimple Street
	*Loye, Philip, Treville Street
	*Mennie, George, Union Street
	Mennie, William, Southside Street
	Pearce, Pollexfen William, George Street
	Richardson, Francis, Canada
	Smith, John Jane, Old Town Street
	*Soper, Eli, Old Town Street
	Vicary, Thomas Merril, Bedford Street
PONTEFRACT . . .	*Brice, James, Market Place
PONTYPOOL . . .	Conway, William
	Wood, William
	Wood, Edwin
POOLE, DORSET . .	Allen, John T., *Secretary*, High Street
	Bloomfield, J. B., High Street
	Hamilton, Horatio, High Street
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	Orange, John, Queen Street
	Rastrick, Joseph Linington, Queen Street
	Warren, James, Landport
PRESCOTT	Kershaw, John Wood
PRESTON	*Armstrong, Henry, 148, Church Street
	*Barnes, James, 114, Fishergate
	*Blackhurst, John T., 32, North Road
	*Cowell, James, 11, Old Shambles
	*Gornall, John, 1, Market Place
	*Harrison, Edward, Fylde Road
	*Isherwood, Joseph, 126, Church Street
	Oakey, Joseph William
	*Raw, John, *Secretary*, 3, Friargate
	*Sharples, William, 73, Church Street
	*Talbot, Thomas, North Road
	*Taylor, John, 157, Friargate
PUTNEY	Farmer, J.
PWLLHELI . . .	Williams, David
RADCLIFFE . . .	Rayner, John
RAMSAY, ISLE OF MAN	Teare, Thomas
RAMSGATE . . .	*Clendon, George, Queen Street
	*Fisher, Charles, *Secretary*, High Street
	*Sawyer, Thomas, Harbour Street

Ramsgate . . .	*Skirmshire, William Wright, Harbour St.
Runcorn . . .	Ward, Peter
Rayleigh, Essex .	Kernot, George Moyce
	Pissey, jun., William
Reading . . .	Brown, Charles, 4, Butter Market
	Cooper, George, 31, Market Place
	*Fardon, Joseph, Bridge Street
	*Hodson, James, *Sec.*, 91, Broad Street
	May, Charles, 4, Butter Market
	*Morphew, James, 2, High Street
	Poulton, Samuel, 3, Duke Street
Redditch . . .	Brown, George
Reigate	*Forbes, William, Bell Street
Retford . . .	Baker, William
Richmond, Surrey	Harris, William Edward, Hill Street
	Harding, Thomas Henry, George Street
	*Hopwood, Thomas, Hill Street
	*Hopwood, Henry, *Secretary*, Hill Street
	*Hopwood, Thomas Charles, Hill Street
	Lloyd, Edmund, George Street
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Ringwood . . .	Maffey, John
	Wheaton, William A., *Secretary*
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Ripon	Chapman, John
	Greaves, Richard
	Judson, Thomas, *Secretary*
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	*Mullet, C.
Rochdale . . .	*Booth, James, 159, Yorkshire Street
	Haworth, Thomas, Cheetham Street
	Leech, Thomas, 14, Yorkshire Street
	Rothwell, Jesse, South Parade
	Taylor, Edward, Old Market Place
Rochester . . .	*King, Thomas Simmons, 208, High Street
	Knight, John William, *Secretary*
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Romsey	Pearce, William
Rotherham . .	Laycock, Henry
Rugby	Garratt, John Colpman
Rugeley . . .	Fowke, William, *Secretary*
	Greensmith, Thomas
Rusholme . . .	*Phythian, J. W., *Isle of Wight*

Ryde, I. W.	*Lowe, Edwin, Pier Street, *Secretary for*
	Peat, Walter, Union Street
Rye	Plomley, James Foulis
Salford	Manfield, John Winter
	Pownall, John
	*Rothwell, William
	Shanklin, Robert
	*Sharpe, Joseph
	Slowe, Abel
Salisbury	Buckell, William, Silver Street
	Farrant, Robert, Market Place
	*Squarey, Charles, *Sec.*, Market Place
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Sandwich	Duncan, F.
Saxmundham	Packard, Edward
Sedgefield	*Stokill, Joseph, High Street
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Shaftesbury	Powell, John
Sheffield	Allott, William Dixon, South Street
	*Austin, Thomas, Fargate
	*Fisher, Robert, 36, Angel Street
	Greaves, Thomas, Fargate
	*Hill, John, 118, West Street
	*Horncastle, Henry, 46, Fargate
	*Machon, Frederick, 2, King Street
	Merryweather, Henry, Haymarket
	*Radley, William Valentine, *Secretary*, 74, Market Place
	*Smith, John, Fargate
	*Salisbury, John Middleton, 30, South St.
	*Taylor, Richard Thomas, 132, High Street
	Wreaks, George D., Angel Street
Shelton, Staffordshire Potteries	*Pierce, Edward Lloyd
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Sherborne	Longman, Robert
	Rawlings, Joseph B.
Shields, North	Barker, Henry, Tyne Street
	Forth, Robert, Clive Street
	Mease, Solomon, 12, Tyne Street
	Ogilvie, jun., Joseph, *Sec.*, Clive Street
	Smith, William, 2, Church Street
	Stephens, Henry, 3, Tyne Street
	Williamson, George, 18, Union Street

Shields, South .	Hudson, George. 57, West Holborn
	Hudson, Thomas, 23, Long Row
	Mays, Robert James John, *Secretary*, 3, Market Place
	Thompson, Ralph 17, Market Place
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Slough	Kilpin, Benjamin Wells
Smethwick . . .	Sutton, William
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	Glaisyer, John Horne, 7, High Street
	*Hunt, Henry, 24, St. Mary Street
	*Mordaunt, Alfred, 1, Portland Street
	*Mordaunt, John, 156, High Street
	*Osborne, Henry, 5, Cheapside
	*Palk, Edward, *Secretary*, 38, High Street
	*Randall, Edward M., 146, High Street
	*Smith, Frederick, 17, Above-bar Street
	*Steere, W. Hooke, 26, Above-bar Street
	*Tryon, George, 112, High Street
South Molton . .	*Paige, William, South Street
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Southsea, Hants .	Mitchell, William Doubt
Southwold, Suffolk	Arthy, Joseph
Spalding . . .	*Boor, Thomas, Market Place
Stafford. . . .	Fowke, William
St. Albans . . .	*Roberts, Albinus
Staines	Slark, J.
Stalbridge . . .	*Davis, James, High Street
Stalybridge . .	Taylor, Thomas
Stamford, Lincolnshire . .	Freeman, Edwin
Stirling	Kirkwood, William
St. Ives	Stocker, Thomas
St. Leonard's . .	*Murton, George A., 36, Marina
St. Neots . . .	Mole, William Tingey
	Sharpe, W. C.
Stockport . . .	Lowndes, Hervey, Hazel Grove
	Shaw, Alexander Henry, Lower Hill Gate
	Shawcross, Thomas, Great Portwood St.
	Shawcross, William, Middle Hill Gate
	Sims, Ollive, Lower Hill Gate
	Taylor, William, Lower Hill Gate
	Walker, James, Great Under Bank
Stockton. . . .	Brayshay, William Bolam, 36, High Stree

STOCKTON . . .	*Dodshon, John, *Secretary*, 120, High Street
	*Harding, John Robert, 88, High Street
	*Hodgson, Edward, 105, High Street
STOKE, DEVONPORT	Hamand, Samuel, Trafalgar Row
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	Snell, H. B.
STONEY STRATFORD	*Howe, Joseph
STOURPORT . . .	*Bancutt, Thomas A., High Street
STOURBRIDGE . .	Bland, John Handel, *Secretary*, High Street
	*Hassall, Samuel Caldwell, High Street
	Hughes, Samuel, ditto
	*Nicholls, James, ditto
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	Simpson, Thomas
STRATFORD-ON-AVON . . .	George, James William
	*Kendall, Fred., *Secretary*, High Street
STROOD, KENT . .	*Martin, Charles, 24, High Street
STROUD	Bateman, James, *Secretary*, High Street
	Gay, George, High Street
	Haycraft, Henry, ditto
SUNDERLAND . .	*Bennett, William, Register Buildings, High Street, Bishopwearmouth
	Cuitt, William, High Street
	Dodgson, Edward, High Street
	Dobinson, William, High Street, Bishopwearmouth
	*Fairley, Robert, 9, High Street, Bishopwearmouth
	Marshall, Francis, 9, High Street, Bishop Wearmouth
	Ord, J. W., High Street, Bishop Wearmouth
	*Osbaldiston, Richard, 2, High Street
	Palin, Benjamin, High Street
	*Ritson, John, *Secretary*, 4, High Street
	Ritson, John George, High Street
	Ritson, Thomas, High Street
	*Sowerby, Jeremiah, 163, High Street
	*Walton, Ralph, High St. Bishopwearmouth
SUTTON COLDFIELD	Smith, William
SWANSEA	*Dawe, Sampson, *Secretary*, 23, Castle Street
	*Dawe, Sampson Rowland 23, Castle Street

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	*Wilson, Charles Thomas, Castle Square
Swindon	Wheeler, Charles Anthony
Sydenham, New .	*Pocklington, James
Sympstone, Devon	Rider, —
Taunton	Burtt, Charles, North Street
	Cox, A. C., East Street
	Hiscock, G. D., Fore Street
	Hitchcock, Joseph, *Secretary*, North St.
	Hitchcock, William Richards, ditto
	Joyce, John, Fore Street
	Leaker, John, East Street
	Lyddon, Charles, Fore Street
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Tenby	Walkington
Tenterden, Kent	Bolton, Thomas, *Secretary*
	Smith, Alfred
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	May, Enoch, *Secretary*
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	*Thompson, John, *Secretary*
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Thrapston . . .	Stanton Samuel
Tipton	Briggs, James
	Cope, Thomas
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	*Sanders, G. L.
Torquay	Havill
	*Wyatt, R. T., *Secretary*
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Truro	James, John
	Job, Richard Osman, *Secretary*
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	Guest, William Frederick
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	Gardener, Charles
	*Maddock, William, *Secretary*, 10, Parade
Uffculm . . .	Curwood, Thomas
Uley	Kathro, James
Upton-on-Severn .	Jackson, George
Uttoxeter . . .	Banwell, George Thomas
Uxbridge . . .	Beasley, Henry
	Chave, John Ansley
	Pullin, Henry

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	Gell, George, Westgate
	Hartley, Edward, Kirkgate
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CROWLAND . . .	*Sanderson, Edward .	Mr. Sanderson
CROYDON . . .	Allen, Henry . .	Mr. Crafton
	Barritt, George . .	Mr. Dymond
	Hunt, Thomas . .	Mr. Crafton
DARLINGTON . .	Abbott, J. T. . .	Mr. Benson
	Dixon, William . .	Mr. Dixon
	Greenwell, Baker . .	Mr. Benson
	Todhunter, W. . .	
DARTMOUTH . .	Carnell, Henry Driver	Mr. Tracey
	Glynn, William . .	
	Richards, J. Edgcome	Mr. Windeatt
DAVENTRY . . .	Conway, John William	Mr. Castell
	Fairlee, Richard James	Mr. Barrett
	Wilcox, James . .	Ditto
DEAL	Depree, Francis R. .	Mr. Brothers
	Hoddy, B.	Mr. Mummery
DEMERARA . .	Carpenter, Henry . .	Mr. Stutchbury
	Jordan, Henry . .	Ditto
	Sloper, William M. .	Ditto
DENBIGH . . .	Williams, Edwin G. .	Mr. Williams
DENBY	Jones, Robert . .	Mr. Parry
DEPTFORD . . .	Atkins, John . . .	Mr. Atkins
	Atkins, Joseph . .	Ditto
	Atkins, jun., Francis E.	Ditto
	Hamilton, Andrew . .	Dr. Shirriff
	Hatfull, Robert . .	
	Rogers, William Shute	Mr. Orridge
	Whiffin, Henry . . .	
DERBY	Bloor, Joseph . .	Mr. Watson
	Cheetham, Henry . .	Stevenson&Parker
	Marshall, John . .	Mr. Sherwin
	Stevenson, Richard .	Stevenson&Parker
DEREHAM . . .	Sharland, Wm.	Mr. Abram
DEVIZES . . .	Jeanes, John . . .	Mr. Sainsbury
	Sloper George Tuck .	Ditto
	Sloper, Samuel Elgar .	Ditto
DEVONPORT . .	Brooking, Samuel . .	Morrice Town
	Hiffley, Richard James	Mr. Radford

TOWNS.		RESIDING WITH
DEVONPORT . . .	*Jeffery, jun., Moses Wm.	Mr. Jeffery
	*Radford, Josiah . .	Mr. Glencross
	*Radford, William . .	Ditto
DISS, NORFOLK .	Cross, Henry . .	Mr. Eldridge
	Fell, Thomas . . .	Mr. Cupiss
	Goodrich, George M. .	Ditto
	Reynolds, James John	Ditto
	Sheppard, Edward John	Ditto
DONCASTER . .	Bird, Ash Rudd . .	Mr. Dunhill
	Cowburn, Charles Hen.	Mr. Pickbourn
	*Dykes, Thomas .	Walker & Co.
	Eadon, John Alfred .	Ditto
	Macgowan, John Tinker	Ditto
	Pinder, William . .	Ditto
DORKING . . .	Martin, James . .	Mr. Cousins
	Perks, Samuel . .	Mr. Ede
	Whitehorn, Thomas .	
DOVER	*Hambrook, John Barber	Mr. Hambrook
DOWNHAM, NORFOLK	Baker, jun., William .	Mr. Nash
	Goddard, Henry E. .	Ditto
DUBLIN	Edwards, Thomas . .	54, Sackville Street
	Hamilton, John Francis	Bewley and Evans
	Morley, John . .	54, Sackville Street
	Owen, George . . .	Bewley and Evans
	Rhodes, T. . .	30, Westmorland St.
	Sargent, Charles F. .	Figgin & Holman
	Saunders, David Price	54, L. Sackville St.
DUDLEY . . .	Dowell, James . .	
DUNSTABLE . .	Clark, Thomas G. Burn	Mr. Clark
	Martin, Henry Gilham	Ditto
DURHAM . . .	Archbold, Ralph . .	Mr. Scawin
	Caldcleugh, James .	Mr. Leighton
	Cowl, William . .	Mr. Burdon
	Cummins, James . .	Mr. Robson
	Hepworth, William .	
	Johnson, George Low	Mr. Trueman
	Leighton, John Hunter	Mr. Leighton
	Mitchell, George . .	Mr. Trueman
	Moon, Joseph Dobson	Ditto
	Morton, John . .	Mr. Scawin
EALING	Metcalf, Tristram Walker	Mr. Hayles
EASINGWOLD . .	Rowntree, John . .	
	Skaife, Thomas . .	Mr. Wiley
	Swales, John . .	
EDINBURGH . .	Alexander, George . .	Mr. Baildon

TOWNS.		RESIDING WITH
EDINBURGH . . .	Ainslie, William . .	Mr. Gardner
	Cumberland, Henry .	Raimes and Co.
	Douglas, Walter .	Mr. Mackay
	Fox, Ely William .	Mr. Baildon
	Fraser, Donald . .	Mr. Lindsay
	Moore, Thomas . .	Leith Walk
	Newton, C. . .	Duncan & Flockhart
	Russell, Thomas . .	Mr. Mackay
	Shaw, John . .	Mr. Lindsay
	Tiler, George Arthur .	Mr. Baildon
	Veitch, William . .	Mr. Lindsay
	Wingrave, J. . .	Davenport&Stedman
EDMONTON . .	Burgess, George . .	Mr. Bridger
ELY	Hardham, Isaac . .	
	Pate, H. T. . .	
	Williams, Henry .	
EPSOM	Harsant, Theophilus .	Mr. Harsant
	*Tondrow, W. A. .	
EWELL, SURREY .	Lawrence, Frederick .	Mr. Peart
EXETER . . .	Adams, H. E. . .	Mr. Trix
	Adams, William . .	Mr. Palk
	Bond, F. . .	Mr. Trix
	Cann, Robert F. . .	Mr. Palk
	Cayme, W. G. . .	Ditto
	Chowen, George . .	Mr. Hooker
	Cornish, William .	Mr. Evans
	Earle, John . .	Mr. Palk
	Farrant, Henry . .	Mr. Ham
	Ham, Charles Holman	Ditto
	Ham, James Holman .	Ditto
	Harvey, H. G. . .	Mr. Knott
	Hawker, E. . .	Mr. Tanner
	Hooker, Thomas C. .	Mr. Powell
	Hooker, Robert H. .	Mr. Hooker
	*Hurst, Wm. Thos. Henry	Evans and Co.
	Kain, F. A. . .	Mr. Tanner
	Maddever . .	Mr. Froome
	McKay, John . .	Mr. Knott
	Merry . . .	Mr. Dyer
	Miller, Alfred . .	Mr. Visick
	Moore, R. . .	Mr. Palk
	Patey, Andrew . .	Mr. Evans
	Payne, G. . .	Mr. Tanner
	Ross, R. B. . .	Dispensary
	Spencer, J. N. . .	

TOWNS		RESIDING WITH
EXETER	Staveley, H. . .	Mr. Pates
	Tanner, H. . .	Mr. Tanner
	Tudball, William Gore	Mr. Ham
	Watson, A. . .	Mr. Trehane
	Wheaton, F. . .	
	Yerbury . . .	
EXMOUTH . . .	Attwater, A. H. .	Mr. Bickford
	Hall, T. . . .	Mr. Thornton
FAKENHAM . .	Carr, Daniel . .	
	Paul, Benj. Horatio .	Mr. Cory
FALMOUTH . . .	Roberts, John . .	Mr. Drew
	Bluett, W. R. . . .	
FAREHAM . . .	Batchelor, Wm. George	
	Smith, Alfred Henry .	
FARNHAM . . .	Clare, Richard Tindall	Mr. Randall
	Green . . .	Mr. Portello
	Randall, John Mayo .	Mr. Randall
	*Reeves, Walter William	Mr. Newnam
FARNSFIELD . .	Swift, Henry . .	
FEVERSHAM . .	Holmes, Thomas .	Mr. Buss
	Marsh, Alfred . .	
FISHGUARD, PEMBROKESHIRE . .	Price, Luke . . .	
FOLKESTONE .	*Davis, jun., J. O. .	
	Davis, Daniel W. .	
FOXCOMBE . . .	*Perry, Solomon . .	
FRAMLINGHAM .	Taylor, John . .	
FRAMPTON, NEAR BIRMINGHAM .	Wood, John Rogers .	Mr. C. Roberts
FROME, SOMERSET	Napper, George . .	Mr. Langford
	Pouncey, Robert Cleal	Mr. Cole
GAINSBOROUGH .	Scott, Richard . .	Mr. Scott
GLASGOW . . .	Campbell, Donald .	
	Hunter, William . .	M'Leod and Co.
GLASTONBURY . .	Wellington, F. G. Noble	
GLOUCESTER . .	Brooks, Richard . .	Mr. Coleman
	Burtt, James . .	Mr. Pearce
	Cadle, George . .	Ditto
	Dance, Wm. Dickens .	
	Fouracre, John . .	Mr. Fouracre
	Frye, Alfred .	Mr. Coleman
	Kirby, Edm. Adolphus .	Mr. Matthews
	*Millington, Frederick .	Mr. Lovett
	Pemberton, Abraham .	Mr. Saunders
	Perry, Henry W. . .	Mr. Tucker

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GLOUCESTER . . .	Trenfield, William .	Mr. Prosser
	Webb, John Wykes .	Mr. Fouracre
GODALMING . .	Marshall, Tho. James .	Mr. Moscrop
GOSPORT . . .	Slater . . .	Mr. Chambers
GRANTHAM . . .	Abbott, Charles . .	Mr. Hough
	Claypole, H. . .	Mr. Thomson
	Foreman, Robert . .	Ditto
	Pascall, Charles . .	Mr. Hough
	Sumner, John . .	Mr. Briggs
GRAVESEND . . .	Mitchell, John . .	Mr. Reid
	Rolfe, George . .	Mr. Spencer
	Spencer, Charles . .	Ditto
	Ward, William . .	Mr. Reid
GREENWICH . .	Chapman, James Edw.	Mr. Baker
	Stone, Frederick . .	Mr. Kelland
	Vaughan, William .	Mr. Baker
GUILDFORD . . .	Gardner, John . .	Mr. Emlyn
	Plank, Arthur C. .	Waller & Martin
GUISBOROUGH . .	Weatherell, Lawrence .	Mr. Duck
HADLEIGH . . .	Rand, Edward . .	Mr. Wick
HALESWORTH . .	Lincoln, Napier . .	
HALIFAX . . .	Akroyd, Thomas .	Mr. Suter
	Baldwin, Joseph .	Mr. Denton
	Dyer, William . .	Mr. Suter
	Watson, Edward .	Mr. Jepson
	Winter, George . .	Mr. Jennings
HAMMERSMITH .	Barnett, William .	Wright and Co.
	Boyes, George . .	Mr. English
	Martin, Francis . .	Wright and Co.
	Wheelwright, William .	Ditto
	Wright, John . . .	Ditto
HAMPSTEAD . .	Smith, John . .	Mr. Smith
	Squires, Samuel . .	Mr. Stevenson
HAMPTON . . .	Henley, John Charles	Mr. Benbow
HANLEY, STAFFORD	Bostock, William .	Mr. Jones
	Newman, Robert .	Ditto
	Swire, George . .	Mr. Yates
HARLESTONE . . .	Muskett, Charles . .	
HARROWGATE . .	Downes, Henry . .	Mr. Waite
	Gascoigne, George . .	Ditto
	Greenwood, John . .	Ditto
	Waite William . . .	Ditto
HASTINGS . . .	Cooper, Robert . .	Mr. Mason
HAVERFORDWEST .	Thomas, John Jabez .	
	Thomas, William .	

TOWNS.		RESIDING WITH
Haverfordwest .	Williams, Thomas .	
Hawkhurst . .	Chambers, James Man	
Hay, Breconshire	Tombs, John . . .	
Henley in Arden	Johnson, Frederick .	
Henley on Thames	Gillett, Charles . . .	Mr. Kinch
	Kinch, Francis . .	Ditto
Hereford . . .	Griffiths, Thos. Chas. B.	Mr. Draper
	Philpotts, John . .	Weston&Jennings
	Williams, Joseph John	Mr. Duggan
	Williams, Thomas . .	Ditto
	Williams, Walter . .	Ditto
Hertford . . .	Cockell, W. H. . .	Mr. Lines
Heslingden . .	Falshaw, Thomas J. .	Mr. Falshaw
	Falshaw, John . .	Ditto
Heywood . . .	Jameson, Joseph Bland	Mr. Jameson
	Schofield, Edmund .	
Hinckley . . .	Pridmore, James . .	
Hitchin, Herts .	Baker, George S. .	
	Humphrey, John . .	Mr. Ransom
Holt, Norfolk .	Rogers, E. D. . . .	Mr. Drozier
Holywell . . .	Turner, F. . .	
Honiton . . .	*Rogers, John Robinson	Mr. Rogers
	*Turner, George . .	Ditto
Horncastle .	Allen, Thompson . .	Mr. Holdsworth
	Baily, Reuben . .	Mr. Whitton
	Bush, Joseph . . .	Mr. Holdsworth
	Caparn, Walter Hare .	Mr. Caparn
	Hill, James . . .	Mr. Holdsworth
	Kemp, William . .	Mr. Whitton
	Lewin, Edward .	Mr. Caparn
	Limon, Henry . . .	Ditto
	Philp, Charles . .	Mr. Kenrick
	Willey, Robert Hardy .	Mr. Caparn
Huddersfield .	Beauland, Samuel . .	Mr. Wrigley
	Brook, John	Mr. Jones
	Dyson, T. . . .	Mr. England
	Hall, James . . .	Mr. Hall
	Robinson, William B.	Mr. Wrigley
	Taylerson, George . .	Mr. Jones
	Walker, John . .	Mr. Hall
Hull	Brown, Leonard F. .	Mr. Barton
	Creaser, Matthew . .	Mr. Lester
	Crosley, John . . .	Mr. Fullam
	Dowker, George . .	Mr. Carlton
	Healey, Samuel George	Mr. Barton

TOWNS.		RESIDING WITH
HULL	Isaac, Daniel George .	Mr. Healey
	Jeffreson, Richard . .	Mr. Lester
	Laybourn, Christopher	Mr. Baynes
	Lister, George . .	Mr. Walker
	Long, Wm. Christopher	Mr. Fullam
	Oxtoby, John William	Ditto
	Sympson, Charles . .	Mr. Carlton
HUNTINGDON . .	Bentham, J. . .	Mr. Bird
	Bevan, Charles Fred. .	Mr. Provost
	Bryant, William . .	Mr. Mann
	Ibberson, Francis . .	Ditto
	Manning, Enoch . .	Ditto
ILFRACOMBE . .	Brendon, F. . .	Mr. Moor
IPSWICH	Alderson, George Fred.	Mr. Alderson
	Arnell, Henry . .	Ditto
	Balls, George . .	Mr. Fitch
	Fitch, Edward . .	Mr. Cook
	Fitch, Lionel . .	Mr. Fitch
	Manby, George . .	Harmer & Ransome
	Ridley, Henry . . .	
	Scott, William . .	Mr. Sawer
	Whitlock, Edwin .	Mr. Chapman
	Wiggin, John J. . .	Harmer&Ransome
IRON BRIDGE, SALOP	Lewis, Edwin . .	Mr. Rowland
KENDAL . . .	Atkinson, Frederick .	Mr. Marriott
	Cartmell, Rowlandson	Ditto
	Claxton, Wm. Dixon Summerland .	Mr. Hudson
	Maudsley, Thomas .	Ditto
	Severs, Joseph . .	Castle Street
KETTERING . . .	Rawlings, Richard .	
KIDDERMINSTER .	Elliott, Wm. Watson .	
	Mason, Wm. Hickman	
	Pearce, James . .	
	Steward, William .	
KIMBOLTON . .	Mills, Robert Mason .	Mr. Dickins
	Southwell, William .	
KINGSTON ON THAMES	Fothergill, Wm. Francis	Mr. Jones
	Northcroft, Jonathan .	Ditto
	Read, J. . . .	
KINGTON, HEREFORD	Haines, Edward . .	Mr. Taylor
KNARESBOROUGH .	*Atkinson, John Thomas	
LLANELLY . . .	Evans, Thomas . . .	Mr. Pridham
LANCASTER . . .	Edmondson, Joseph .	Mr. Whimpray

TOWNS.		RESIDING WITH
LANCASTER	Pratt, William . .	Mr. Wilson
	Richardson, Thomas .	Mr. Aldren
	Smith, Edward . .	Ditto
	Wearing, Richard . .	Mr. Wilson
LAUNCESTON . .	Eyre, Jonathan Symes	
	Ferris, James . .	Sing and Son
	Northway, John .	
	Spettigue, William ·	
LAYTONSTONE, ESSEX	Whittingham, Rd. John	
LEAMINGTON . .	Avery, R. . .	Mr. Pierce
	Badham, William .	Mr. Colbeck
	Barron, William . .	White and Co.
	Cobb, Walter Williams	Mr. Harper
	Fessey, Morton . .	Mr. Flecknoe
	Gould, John Granger .	Mr. Herring
	Johnson, Geo. Mackness	Ditto
	Jones, James . .	White and Co.
	Lewis, John . .	Mr. Davis
	*Lowe, Edward . .	White and Co.
	Phillips, Thomas .	Mr. Harper
	Raymond, Edward M.	Mr. Wright
	Wells, Edward George	Mr. Caparn
	White, William . .	White and Co.
	Wick, James . . .	Mr. Wing
LEEDS . . .	Atkinson, Rd. Marshall	
	Barraclough, Thomas .	Mr. Lands
	Bilborough, John . .	Briggate
	Bilborough, William P.	Ditto
	Billington, Henry . .	Mr. Rhodes
	*Birkett, Richard . .	Mr. Smeeton
	Cawthorn, Henry . .	Mr. Lands
	Cleworth, James . .	
	Crowther, John . . .	
	Fryer, Frederick . .	Mr. Harvey
	Fullam, John William	Messrs. Chapman
	Gill, William . .	Mr. Rhodes
	*Hick, Joseph . . .	Mr. Smeeton
	Jones, Edward George	Ditto
	Pearson, John Thomas	
	Ridsdale, James . .	Mr. Rhodes
	*Smeeton, Edward W. .	Mr. Smeeton
	Smallpage, Isaiah . .	Infirmary
	Strachan, Alexander .	Mr. Rhodes
	Walker, Joseph . .	
	White, Luke Pearson .	Mr. C. Hays

TOWNS.		RESIDING WITH
LEEDS	*Whytehead, Thomas .	Mr. Smeeton
	Williamson, James . .	Ditto
LEICESTER . .	Austin, James Battle .	Mr. Parson
	Burdwood, James . .	Mr. Goddard
	Inchley, James . .	Mr. Parson
	Setchfield, Charles . .	Mr. Fowler
	Teear, George . . .	Mr. Teear
	Windram, Wm. James	
LEIGHTON BUZZARD	Braund, Edwin . . .	Mr. Richmond
	Moate, Wm. Flockton.	Mr. Readman
	Wilson, William . .	Mr. Richmond
LEOMINSTER . .	Bowen, William . .	Mr. Davis
	Davis, David . . .	Ditto
	Goode, Thomas . . .	Mr. Goode
	*Plevey, Henry . . .	Mr. Davis
	Wheeler, John . . .	Mr. Gilkes
LEWES	Chaplin, Alfred . . .	Mr. Saxby
	Gain, Frederick . .	Mr. Heads
	Martin, Thomas . .	Mr. Martin
	Martin, Silas John . .	Ditto
	Nash, S. T. B. . . .	Mr. Paine
LICHFIELD . . .	Chapman, J. Robison .	Mr. Morris
	Harding, Robert . .	Mr. Standley
LINCOLN . . , .	Edwards, Henry . .	Mr. Nettleship
	Turner, John . . .	Ditto
	Wilks, Cuthbert . .	Mrs. Sympson
LISKEARD . . .	Hoskins, Williams .	Mr. Eliott
LIVERPOOL . . .	Amos, John Stewart .	Mr. Shaw
	Anderson, Arthur . .	Byam Street
	Aspinall, George James	Mr. Aspinall
	Barker, John Maw . .	Heath & Coupland
	Barker, Richard . .	Ditto
	Bramwell, jun., George	Park Lane
	Bright, P.	
	Bromley, Charles . .	Heath & Coupland
	Brown, James . . .	Apothecaries' Hall
	Clarke, Edward . . .	3, St. George's Place
	Cotton, Thomas . .	Mr. Jones
	Coupe, William . .	Mr. Clay
	Craine, Edward Samuel	70, Lower Warwick Street
	*Cuttle, James . . .	Horley and Eyre
	Davies, Jesse Conway .	Prescott Street
	Day, William . . .	Mr. Blake
	Dewe, James Lamball .	Mr. Priestly

TOWNS.		RESIDING WITH
LIVERPOOL . . .	Ellis, William . .	Mr. Jones
	French, John . .	Apothecaries' Hall
	Gibson, James Taylor	Mr. Wagstaff
	Gough, James . .	
	Green, William Moore	Mr. Mucklow
	Higgins, Charles .	Horley & Eyre
	Houghton, James .	Mr. Ellison
	Howarth, James . .	Mr. Nuttall
	Howarth, James . .	Mr. Parkinson
	Jackson, Jared . .	Mr. Aspinall
	Jardine, Headman .	Mr. Bradford
	Jones, Henry . .	Mr. Jones
	*Jones, Robert .	Mr. King
	Karran, Robert . .	
	Keay, Thomas . .	Mr. Roberts
	Keene, Thos. Willcock	Mr. Clay
	*King, Richard . .	Apothecaries' Hall
	Kirby, Henry Peebles	Mr. Brown
	Mercer, Nathan . .	Mr. Johnson
	Morris, John . .	Mr. Howitt
	Norfolk, George Henry	Mr. Weatherill
	Owen, Edward . .	
	Paterson, Thomas .	Mr. Blake
	Prescott, John . .	Mr. Rawson
	Rawdon, Joseph . .	Mr. Owen
	Rogers, Joseph Stafford	Horley and Eyre
	Rowlands, Thomas .	Mr. Williams
	*Siddeley, Thomas .	Mr. Tiernan
	Simpson, John . .	
	Smith, John . .	
	Smith, William Henry	Mr. Simons
	Stevens, Alfred . .	Thompson & Sons
	Tipper, James . .	Mr. Jones
	Toll, Alexander Pearson	Mr. F. Sykes
	Topping, Thomas .	Mr. Simon
	Tyres, George . .	
	Venables, Jos. Hassell .	Mr. Fisher
	Ward, William Jones .	Mr. King
	Welch, Thomas . .	Mr. Bradford
	Whitehead, Thomas .	
	Wild, Thomas . .	Mr. Rawles

LONDON.

Adams, Edwin . . .	11, Little Britain
Alexander, Alfred . .	172, New Bond Street
Allen, Arthur . . .	9, Albion Place, Hyde Park Square
Allen, John Vickerman	10, Lawrence Pountney Lane
Allen, Peter	71, Goswell Road
Allison, Launcelot . .	1, Harleyford Place, Kennington
Anderson, Charles . .	Union Row, Camberwell
Archer, Edward . . .	82, St. John's Street Road
Archer, Edmund . . .	254, High Street, Borough
Armstrong, George . .	35, Lamb Street, Spitalfields
Arnold, George Richard	18, Conduit Street
Asling, Brelsford . .	9, Charlotte Street, Blackfriars' Road
Atkinson, John . . .	9, Charlotte Street, Blackfriars' Road
Atkinson, William . .	187, Bishopsgate Street
Badcock, John . . .	35, Haymarket
Baggott, Richard . .	12, Calthorpe Place, Gray's Inn Road
*Baigent, William Henry	31, Southampton Street, Strand
*Bailey, Delamore J. .	31, Southampton Street, Strand
Baily, Henry James .	29, Little Newport St., Leicester Sq.
Baker, Edwin . . .	40, Aldersgate Street
Ball, Walter Frederick	Fore Street
Bannick, Henry S. . .	7, Pall Mall, East
Barber, James William	31, Southampton Street, Strand
*Barnard, John . . .	338, Oxford Street
Barnard, Francis . .	53, Red Lion Street
Barraud, Charles D. .	Camberwell
Bartlett, John . . .	Acre Lane, Brixton
Barton, Charles Edward	96, Oxford Street
Bastick, William . .	1, Arlington Street, Piccadilly
Bastick, Samuel . . .	80, Holborn Bridge
Bates, John	132, Edgeware Road
Bateman, Robert P. .	72, Euston Square
Bayles, William . . .	66, Wardour Street
Beach, Hugh Percy .	45, Haymarket
Beaton, John William .	261, Oxford Street
Beddoe, Charles . . .	2, Edward Street, Portman Square
Beedle, Charles . . .	372, Oxford Street
Beetham, Joshua . .	2, New Cavendish Street
Bellingham, Henry J. .	31, London Street, Fitzroy Square
Bellingham, Robert . .	7, Orange Street, Red Lion Square
Benham, George . .	10, Water Street, Blackfriars
*Bentley, Robert . . .	338, Oxford Street
*Bilton, jun. George, .	Three Colts' Street, Limehouse

Binsley, James . . .	27, Thavies Inn
Bird, William H. . .	5, Frederick Place, Kent Road
*Blake, Charles Titcomb	47, Piccadilly
*Blake, William F. . .	277, Oxford Street
Boor, Thomas . . .	Bush Lane
*Bourdas, Isaiah . . .	30, Conduit Street
Bowdage, Samuel . .	105, Holborn Hill
Bowdage, Thomas . .	105, Holborn Hill
Bowman, William . .	196, Oxford Street
Brett, Samuel . . .	13, Blackfriars' Road
Brewer, Edward . .	38, Duke Street, Manchester Square
Britten, John . . .	8, Store Street
Brooks, Charles . . .	19, Penton Place, Walworth
Broom, Robert . . .	26, Oxford Street
Brown, Henry F. . .	79, Bishopsgate Street
*Brown, William . . .	177, Regent Street
Brown, Robert Thomas	11, Old Fish Street
Brown, Benjamin . .	14, City Road
*Bryant, John	125, Lower Thames Street
*Bryant, John . . .	Alfred Place, North Brixton
*Bucklee, William Henry	27, Haymarket
Burbidge, John . . .	2, Clark's Place, Islington
Burch, Jeremiah . .	16, Newgate Street
Burden, Thomas . . .	14, Grosvernor Street West, Pimlico
Burden, Edward . .	6, Store Street, Bedford Square
*Burdwood, Thomas .	237, Tottenham Court Road
Burlton, James . . .	300, Holborn
Burnidge, Edwin . .	Whitecross Street
Bury, W. James W. .	40, Aldersgate Street
Buss, Thomas . . .	4, Hampton Street, Gray's Inn Road
*Butler, Thomas, jun. .	4, Cheapside
*Butler, Samuel . . .	4, Cheapside
Bygrave, William . .	21, Liverpool Road, Islington
Caffyn, Thos. Arnold .	277, Oxford Street
Calder, James . . .	Knightsbridge
Capper, Samuel James	2, Trinity Row, Islington
Carey, Thomas . . .	14, Claremont Place, North Brixton
Carter, Richard Hartley	
*Cartwright, William .	11, Little Britain
Catley, William . . .	48, Wigmore Street
Cattlin, Henry . . .	11, Gower Street, North
Cecil, Charles John S.	18, Smithfield Bars
Chadwick, Henry . .	18, Upper Charles Street, Northampton Square
Chalmers, Alexander .	60, George Street
Chapman, J. W. . .	55, Brompton Row

Chapman, Rich. James	80, Holborn Bridge
Charles, John Edward .	16, Newgate Street
Chaston, Robert . . .	213, Upper Thames Street
Childs, Philip . . .	40, Aldersgate Street
Chippendale, Fred. G. .	248, Strand
Clarke, Thomas M. . .	Mare Street, Hackney
Clarke, C. F. G. . .	5, Castle Street, Falcon Square
Clarke, William . . .	4, George's Place, Walworth Road
Clarke, John	125, Lower Thames Street
Clarke, William . . .	40, Aldersgate Street
Clay, John	60, Bartholomew Close
Clift, Edward . . .	3, Sloane Street
Coates, William . . .	15, Sloane Square
Cocksedge, Henry B. .	27, Haymarket
Cole, jun., William H. .	101, High Holborn
*Cole, Thomas Walter .	30, Conduit Street
Coleman, William . .	16, Upper Southwick Street, Oxford Terrace
Colling, Robert W. .	213, Upper Thames Street
*Collins, John R. . .	30, Conduit Street
Cook, John V. . . .	95, Bishopsgate Street
Cook, Richard Gardner	2, High Street, Islington
Cooper, Thomas S. . .	27, Aldgate
Cooper, William . . .	1, Brettin Terrace, King's Rd., Chelsea
Constance, Edward .	23, King Street, Whitehall
Corfield, William A. .	254, High Street, Southwark
Corfield, Daniel . .	47, High Street, Camden Town
Cottingham, Wolfran .	196, Ditto
Cowdrey, George T. .	93, Cheapside
Coward, George W. .	1, Francis Street, Golden Square
Cox, John	Keen's Row, Walworth
*Cracknell, Charles . .	277, Oxford Street
Carne, Charles . . .	3, Prince's Street, Leicester Square
*Crawley, John . . .	1, Cockspur Street
Creag, Edward . . .	1, George Yard, City
Cripps, James . . .	300, Holborn
Crispe, James . . .	228, Piccadilly
*Croad, Samuel . . .	2, Plough Court
Crocker, Frederick . .	1, Hart Street, Bloomsbury
Crompton, John C. .	300, Holborn
Cross, William Sowen .	125, Lower Thames Street
Crossley, John . . .	41, Bishopsgate Street
Croucher, William . .	223, High Street, Shadwell
Crow, Henry	44, Upper Manor Street, Chelsea
Cull, Joseph	79, St. Paul's Churchyard
Cumbers, John . . .	25, George's Place, Knightsbridge

Curtis, Frederick . .	125, Oxford Street
Curtis, Edward . . .	11, Old Fish Street
*Curtis, Edwin . . .	11, Old Fish Street
Cutlack, William . .	114, Lambeth Walk
Dallas, John	41, Moorgate
Danson, Henry . . .	
Darby, Stephen . . .	22, Conduit Street
Davenport, Edward .	33, Great Russell Street, Bloomsbury
Davids, G. W. . . .	29, Fleet Street
Davies, Henry Edward .	43, Wood Street, Cheapside
Davis, Thomas . . .	Terrace, Kensington
Davison, Richard . .	97, High Street, Marylebone
Davison, William . .	177, Ratcliffe Highway
Davy, Edward . . .	36, Paternoster Row
Davy, Frederick . . .	60, Tottenham Court Road
Davy, Thomas . . .	7, Poultry
Delatouche, William .	76, Bond Street
Denham, William . .	101, Holborn
Dennison, Matthew .	95, Bishopsgate
Dew, Joseph Jennings	133, Ratcliff Highway
Dickinson, William .	136, New Bond Street
Dimoch, Henry . . .	95, Minories
Dix, Samuel Booth .	37, Leadenhall Street
Dobinson, Benjamin .	52, Doughty St., Mecklenburgh Sq.
Dores, James . . .	104, St. John Street Road
Doughty, Richard . .	4, William Street, Knightsbridge
Downes, Joseph . . .	Bow
Dowthwaite, William .	15, Crawford Street
Drage, Charles . . .	226, Upper Thames Street
Drummond, Duncan .	68, Southampton Street, Pentonville
Dunn, Frederick Alex.	272, Strand
Dunn, Edward . . .	25, St. Mary Axe
*Dutton, John . . .	Clapham
Dyer, James	79, St. Paul's Churchyard
Dyson, . . .	Dorset Square
Eardly, John	13, Tottenham Court Road
Eastop, William Thos.	4, Denmark Row, Cold Harbour Lane, Camberwell
Edden, John	136, New Bond Street
Edwards, John . . .	60, Bartholomew Close
Eggington, Herbert .	116, Albany Street, Regent's Park
Elliott, William . . .	76, York Street, Westminster
*Elliott, Thomas Henry .	Clapham
Ellis, William Scrivener	11, Tothill Street
*Ellis, George Henry .	Pavement, Moorfields
Elsey, John	55, Fore Street

*Emerson, William . .	49, High Street, Kensington
Etheredge, James Cox .	11, Friday Street
Etherington, Thomas G.	52, Marchmont Street
Evans, Edward . . .	25, Budge Row
*Evans, Richard Hawley	60, Bartholomew Close
Eves, Frederick . . .	Clerkenwell Green
*Fairbank, James Hack	2, Plough Court
Farr, Richard . . .	2, Homefield Place, Stoke Newington
Farrant, John G. . .	199, Fleet Street
Fenn, John T. . . .	17, Regent Street, Horseferry Road
Fennell, Sidney . . .	22, King Street, Covent Garden
Finch, Thomas . . .	24, Grafton Street, Fitzroy Square
*Fincham, Henry Sykes	Charing Cross
Finemore, William F. .	18, Thornton Street
*Fisher, Henry . .	42, Castle Street, Oxford Street
Fisher, George V. W. .	Conduit Street
Flintoff, Francis . . .	213, Upper Thames Street
Floar, John	36, Drummond Street, Euston Sq.
Foott, Richard R.	48, Great Marylebone Street
Forester, Richard . .	93, Cheapside
Fouracre, Robert . .	272, Oxford Street
Frampton, Thomas . .	9, Upper Seymour Street
*Francis, George . . .	18, Thayer Street, Manchester Sq.
Francis, George B. . .	338, Oxford Street
Freeman, Robert . .	38, High Street, Kensington
Freestone, Thomas M. .	390, Strand
French, Paul Evans .	Bush Lane
*Frith, Edwin, John . .	87, Snow Hill
Fudge, Robert . . .	23, Paddington Street, Marylebone
Garden, Felix R. . .	372, Oxford Street
Gardner, Matthias . .	22, Conduit Street
Garnham, Barrington .	20, Portman Street
Garrard, Arnold Finchett	104, Strand
Garrard, William . .	6, Berkeley Square
Gedge, William S. . .	115, Wardour Street
*Gerard, Philipe A. . .	66, Grosvenor Terrace, Westminster
Gibson, William . .	
Gigner, John	37, Red Lion Street, Holborn
Gill, George	Bow
Gillow, Francis . .	11, Old Fish Street
Gitsham, William . .	Lower Street, Islington
Glynn, William O. . .	25, Budge Row
*Goodger, David . . .	29, Haymarket
Goodwin, John . . .	271, Bethnal Green Road
Goodyer, Frederick R.	125, Lower Thames Street
Gould, John	6, New Weston Street, Southwark

*Grant, James . . .	24, Great Russell St., Covent Garden
Grayburn, James . .	147, Oxford Street
Grayling, William Irving	late of Ipswich
Green, William Henry	Kennington Common
*Greenish, Thomas . .	30, Conduit Street
Greenwood, Samuel .	154, Whitecross Street
Grindle, John . . .	122, Pall Mall
*Grounds, David . . .	49, Threadneedle Street
Hadfield, Thomas R. .	11, Norton Folgate
Hadfield, Joseph R. .	11, Norton Folgate
Hall, William C. . .	Turnham Green
Hailey, Charles Collison	4, Old Fish Street
Hall, Robert	101, High Holborn
Halliday, William R. .	Whitecross Street
Hamilton, Charles . .	Apothecaries' Hall
Hanbury, jun., Daniel	Plough Court
*Hanbury, Wm. Allen .	Ditto
*Handsley, Taylor . .	97, High Street, Marylebone
*Harding, J. T. . . .	4, Cheapside
Harding, William M. .	24, Judd Street
Hargreaves, Robert .	St. Paul's Churchyard
*Hargood, William R. .	5, Hanover Place, Regent's Park
Harman, John Baker .	Camberwell
Harper, John Hooper .	2, Conduit Street, Westbourne Terrace, Hyde Park
Harris, D. R. . . .	
Harris, George . . .	3, Eldon Place, Lower Islington
Harris, William . .	8, Store Street, Bedford Square
Harris, John Esau . .	Bethnal Green Road
Harris, James . . .	16½, Blackfriars' Road
Harrison, Henry . .	9, Taunton Place, Regent's Park
*Harrold, John George .	277, Oxford Street
Hart, Thomas . . .	101, High Holborn
Harvey, Henry . .	29, Munster Street, Regent's Park
Hasleden, Adolphus F.	18, Ditto
Haworth, James King .	22, Conduit Street
*Hawthorn, Josiah Mayo	86, Snow Hill
Hay, Charles George .	176, Blackfriars Road
Hayward, Edward . .	40, Aldersgate Street
Heath, Thomas . . .	226, Blackfriars Road
Heath, George . . .	143, New Bond Street
Hemmingway, Walter .	163, New Bond Street
Hemmingway, Alex. .	79, St. Paul's Churchyard
*Hendsley, Henry . .	40, Aldersgate Street
Hickley, Thomas P. .	Camberwell New Road
Hiles, Francis . . .	24, Garlick Hill

Hill, Richard . .	White Cross Street
*Hills, Thomas Hyde .	338, Oxford Street
Hird, John Tucker . .	25, Budge Row
Hobson, John . . .	11, King's Road, Chelsea
Hockin, John B. . .	38, Duke Street, Manchester Square
Hodder, Henry . . .	51, Judd Street, Brunswick Square
Hodgkinson, Henry .	105, Crawford Street
Hodgson, Richard . .	12, Bridgewater Square
Holah, Spencer . . .	95, Minories
Holden, James . . .	27, Hart Street, Bloomsbury
Holland, Samuel . .	Great George Street, Bermondsey
Holmes, William . .	1, Spring St., Sussex Gds. Hyde Pk.
Holt, George P. . .	226, Blackfriars' Road
Hooper, Thomas W. .	2, New Cavendish St., Portland Pl.
Hooper, Trueman . .	22, Commerce Place, North Brixton
Hopkins, Thos. Barker	Staverton Row, Walworth
Hopkins, Thomas . .	36, Davies Street, Berkeley Square
Horncastle, John . .	221, Tottenham Court Road
*Horner, Robert F. . .	95, Bishopsgate Street
Howarth, John . . .	27, King Street, St. James's
Howden, jnn., Robert .	Islington Green
Hughes, William P. .	122, Piccadilly
*Humphrey, Richard .	106, Edgeware Road
Hunt, William C. . .	Hackney
Hunt, William . . .	82, St. John's Street Road
Hutton, Charles . .	178, Bishopsgate Street Without
Huxtable, John . .	104, St. John's Street, Clerkenwell
Isaacs, Jacob	95, Minories
Jackson, James B. . .	32, Whitecross Street
Jarvis Robert	5, Everett Street, Russell Square
Jennings, John . . .	262, Tottenham Court Road
Jessop, William H. .	19, Park Terrace, Regent's Park
Jeynes, George W. . .	60, Leather Lane
Jeynes, Edward . . .	49, Great James Street, Lisson Grove
Johnson, Frederick . .	8, Castle Street, Leicester Square
*Jones, Frederick O. .	12, Stanhope Terrace, Hyde Park
Jones, Henry Stevens .	18, Mount Street, Grosvenor Square
Jones, John	94, Smithfield Bars
Jones, John	171, High Holborn
Jordan, Thomas . . .	136, New Bond Street
Keating, Emanuel . .	60, Bartholomew Close
Kent, Henry	88, Chancery Lane
Kent, Edward . . .	19, Southampton Row, Bloomsbury
Kerby, John Wesley .	11, Regent Street, City Road
Kerridge, Benjamin .	17, Prince's Street, Red Lion Square
Kershaw, James . . .	78, King William Street, City

Kershaw, Richard . .	95, Bishopsgate Street
Kesteven, John . . .	
King, Edward . . .	34, Judd Street, Bethnal Green
King, William G. . .	20, Queen's Row, Pimlico
King, Charles Thomas .	34, Store Street, Bedford Square
Kirby, John	20, A, Portman St., Portman Square
*Kirkham, Thomas . .	14, Edgeware Road
Knott, George Anstice	Holloway
Knowsley, Robert . .	Upper Baker Street
Lacey, James Henry .	1, St. John Street, Clerkenwell
Lack, John Werner .	178, Tooley Street
Lambert, E. T. . . .	93, Cheapside
Lambert, George . .	161, Bermondsey Street
Lane, Edward . . .	108, Long Acre
Lansdale, Ralph . .	25, Coventry Street
Large, John Hood . .	7, Amwell Street, Claremont Square
Lavers, .	56, Hackney Road
Lee, James . : . .	177, Strand
Leigh, James	105, Holborn Hill
*Leigh, Henry William	79, Bishopsgate Street
*Letchford, Robert . .	4, Cheapside
Lewin, Francis . . .	10, Glasshouse Street
Lidwell, Joshua . . .	248, High Street, Poplar
Lindo, Benjamin . .	22, Ludgate Hill
Living, Obadiah . .	1, Henrietta Street, Covent Garden
Lloyd, Arthur . . .	22, Ludgate Hill
Lockyer, George . . .	23, Foxley Road, Kennington
*Lodge, Thomas . . .	338, Oxford Street
Lovewell, Thomas C. .	33, Leicester Square
Lowth, Henry W. . .	7, Percival Street, Goswell Street
*Luscombe, H. Andrews	2, Plough Court
Lynn, Crispus Thomas .	195, Whitecross Street
Mackay, John Brunt .	6, New Wharf, Bouverie Street
Mackrill, Henry C. . .	Earl Street, Finsbury
*Maddrell, Robert . .	146, Holborn Bars
Maitland, Alexander .	5, Lower Sussex Place, Hyde Park
Major, John Clarkson .	Islington Green
*Mann, Thomas . . .	27, Great Tower Street
Mann, Samuel L. . .	248, Strand
*Mansell, William . .	2, Plough Court
March, William . . .	25, Princes Street, Soho
Mares, Walter . . .	11, Norton Folgate
Marracott, Henry . .	24, Bouverie Street
Martin, John Jones .	25, St.George's Place, Knightsbridge
Martin, Alfred . . .	11, Little Britain
Mason, Henry . . .	29, Francis St., Tottenham Court Rd.
Massa, William . . .	10, Water Street, Blackfriars

Maunder, Henry . .	228, Piccadilly
Mawby, William . .	68, Fleet Street
May, William Henry .	144, High Holborn
May, Edward . . .	12, New Cavendish St., Portland Pl.
Mc Cullock, Frederick	95, Bishopsgate Street
Mc Cullock, Charles A.	Ditto
McLacklan, James . .	42, Whitechapel Road
McLeod, Alexander .	44, Marshall Street, Golden Square
Merrison, George . .	12, Marlborough Street, New Cut, Blackfriars' Road
*Middleton, Francis . .	338, Oxford Street
Miller, John	66, Grosvenor Terrace, Westminster
Milroy, James . . .	30, Fitzroy Square
*Mills, Thomas H. . .	63, Great Russell Street, Bloomsbury
Molesworth, William F.	111, Piccadilly
Morgan, Joseph . . .	14, Trinity Terrace, Trinity Square
Moore, Joseph . . .	Wigmore Street
*Moore, James Lodge .	27, Haymarket
Moore, Thomas . . .	King's College Hospital
Moore, Henry C. . .	125, Lower Thames Street
Moreton, George . .	48, Church Street, Bethnal Green
Morgan, William B. .	Belgrave Square
Mornement, Henry J. .	80, Holborn Bridge
Morris, Edward George	58, Minories
Morrison, Alexr. W. .	1, Brettin Place, King's Rd., Chelsea
Morse, Charles B. . .	89, Bishopsgate Street Within
*Morson, jun., Thomas .	19, Southampton Row, Bloomsbury
*Moss, John	338, Oxford Street
Moss, William . . .	309, High Holborn
Moulton, Joseph . .	6, Giltspur Street
Mowbray, George M. .	36, Paternoster Row
Mudge, Walter T. . .	5, Old Fish Street
Mullinster, Joseph . .	60, Leather Lane
Nevill, John P. . . .	129, Fenchurch Street
*Newton, James . . .	61, Cannon Street
Nicholls, John . . .	95, Minories
Nicholson, Thomas . .	22, Brunswick Place, Barnsbury Rd., Islington
*Nicholson, W. Wilson .	Tabernacle Square
Nightingale, Henry L. .	104, St. John's Street, Clerkenwell
Nind, George . . .	8, Torrington Place
O'Connor, Maurice J. .	123, High Street, Camden Town
Odell, Thomas . .	175, Aldersgate Street
Officer, John Knowles	235, Strand
Ogle, Mack F. . . .	7, Brett's Buildings, Camberwell
Oldfield, Henry . . .	5, Old Fish Street
Oliver, Henry . . .	104, St. John's Street

O'Reilly, William Chas.	Apothecaries' Hall
Organ, Joseph . . .	7, Poultry
Owen, William . . .	146, Holborn Bars
*Owen, Griffith . . .	106, Edgeware Road
Owles, James . . .	54, Watling Street
Page, John	47 Blackfriars Road
Paget, Thomas . . .	3, Claremont Square, Pentonville
Paine, Trayton . . .	1, York Place, Kentish Town
Parkin, James . . .	41, Bishopsgate Street
Paternoster, William .	7, Windsor Place, Old Kent Road
Paternoster, George W.	Ditto
*Pattison . . .	late of Edinburgh
Peacock, Henry . . .	75, Newington Causeway
*Pearce, John . . .	7, Poultry
Pease, John Robert . .	54, Piccadilly
Peck, John Senior . .	81, St. John Street
Peirson, Samuel Simonds	1, Park Street, Canonbury Square
Pepper, John . . .	Brompton
*Peppercorn, Benjamin .	late of Luton
Peppin, Sydenham H. .	2, Alfred Place, Alexander Square
Percy, George . . .	12, Lower Brook Street
Pettigrew, James H. .	89, Bishopsgate Street Within
Phillips, John . . .	101, Drury Lane
Phillips, William T. .	54, Piccadilly
Pierce, Samuel . . .	132, Edgeware Road
Pinniger, Francis B. .	4, Thayer Street, Manchester Square
Plummer, George . .	11, Gower Street North
Poole, George . . .	2, Hatfield Street, Stamford Street
Pooley, John Carpenter	14, Grosvenor Street, West Pimlico
Potter, . . .	100, Upper Thames Street
*Potter, Henry . . .	31, Regent Street
Potts, John	55, South Audley Street
Powell, Richard . . .	60, Bartholomew Close
Power, Edward . . .	53, Bishopsgate Street
Preston, Stanton, W. .	94, Smithfield Bars
Pretty, John Rawlinson	4, Cheapside
Price, Astley Paston .	96, Oxford Street
Price, John James . .	48, Wigmore Street
Price, Hugh	10, Bedford Place, Russell Square
*Priest, John Paul . .	115, Holborn Bridge
Pullin, Edward . . .	142, Bishopsgate Street Without
Ragsdale, Walter . .	Peckham
Read, R. E. . . .	late of Ipswich
Read, William . . .	21, Paddington Street
*Rear, Thomas James .	87, Snow Hill
Redfern, John . . .	8, Torrington Place
Redgrave, William . .	6, New Weston Street, Southwark

Reece, John	74, Westbourne Street, Eaton Square
*Rees, John	27, King Street, St. James's
Reeve, William . . .	3, Trevor Terrace, Knightsbridge
Reid, David	13, Blackfriars' Road
Reninson, . . .	38, Duke Street, Grosvenor Square
Rhodes, Frank . . .	63, Great Marylebone Street
Richards, W. J. Charles	40, New Bridge Street, Blackfriars
Risbrock, Henry . .	6, Giltspur Street
Roach, Pope	104, High Street, Borough
Roake, Joseph . . .	37, Berners Street, Oxford Street
Roberts, Philip . . .	60, Bartholomew Close
Roberts, George . . .	Newington
Roberts, Charles Duncan	180, Strand
Roberts, Michael . .	25, Budge Row
*Roberts, H. Constable	140, Leadenhall Street
Robinson, George Perks	141, High Street, Poplar
Robinson, Henry . .	11, Crescent, Southwark Bridge Rd.
Robinson, Reuben . .	28, Lamb's Conduit Street
Rogers, William . . .	63, Oxford Street
*Roll, James Capon . .	89, Cannon Street
Rolph, James . . .	49, Bethnal Green Road
Rosser, Walter . . .	133, Ratcliff Highway
Routledge, George . .	35, Charing Cross
Rowe, Thomas D. . .	223, High Street, Shadwell
Rowlands, Thomas . .	213, Upper Thames Street
Rownson, John William	108, Long Acre
Rumble, George . .	19, Goodge Street
Russell, George Cooper	372, Oxford Street
Sabine, Edward . . .	Apothecaries' Hall
Sadler, William . . .	Norton Folgate
Sage, William J. . .	132, Edgeware Road
Salisbury, Samuel . .	37, Leadenhall Street
Salter, John Edward .	10, Pall Mall
Sampson, Robert Geo.	10, Wilson Street, Gray's Inn Road
Sandford, George Webb	47, Piccadilly
Sandford, Richard . .	54, High Street, Whitechapel
Sargent, William . .	213, Upper Thames Street
Savory, Thomas Field .	5, Old Fish Street
Saward, George . . .	93, Cheapside
Saxeby, William Simons	11, Tothill Street
Scarborough, Wm. H.	16, Pitfield Street, Hoxton
Schacht, Frederick . .	New Bond Street
*Scholefield, Henry . .	338, Oxford Street
*Scholefield, George .	Ditto
Scott, Herbert . . .	2, Morgan's Place, Liverpool Road
Scrivens, William . . .	Clapham Common

Seaton, John L. . . .	Anchor Wharf, 9, Upper Thames St.
Sefton, Abraham . .	Peckham
Selby, Edwin . . .	55, Fore Street
Selleck, Edward . .	5, Bouverie Street
Shapton, John Hill . .	24, Judd Street
Sharp, George Young .	14, Grosvenor Street West
Sharpe, Marmaduke L.	25, Goswell Road
Shepherd, John Edward	24, Bouverie Street
Shepherd, Edmund . .	6, New Wharf, Bouverie Street
Shepherd, James . .	Ditto
*Shirley, John . . .	49, Salisbury Square
Simmons, Frederick .	17, Marchmont Street
Simmonds, John . .	24, Bouverie Street, Fleet Street
*Singleton, John . . .	79, St. Paul's Churchyard
Skeffington, James F. .	Earl Street, Finsbury
Slack, William . . .	6, Giltspur Street
*Smith, George N. . .	29, Haymarket
*Smith, John	12, Wells Row, Islington
Solly, George . . .	3, St. George's Circus, Blackfriars Rd.
Southam, Thos. Corbett	Stoke Newington
Spencer, John Alex. .	Lamb's Conduit Street
Spike, Richard . . .	Red Cross Street
Sprackett, George . .	18, Conduit Street
Squire, John	198, Oxford Street
Starkie, Richard Stringer	4, Strand
Stead, John M. . . .	213, Upper Thames Street
Steele, John	Ratcliff Highway
*Steele, Stephen . . .	177, Regent Street
*Sterriker, John . . .	40, Aldersgate Street
Sterry, Henry Whatling	7, Waterloo Pl., Commercial Rd. East
Stevens, George J. .	High Street, Stoke Newington
Stirling, John Richard	86, Whitechapel
Stone, Edward . . .	16, Newgate Street
Strange, jun., James .	20, Queen's Row, Pimlico
Stringer, Edward . .	95, Bishopsgate Street
Strong, William Fred. .	9, Wellington Street London Bridge
Stubbins, Thomas . .	147, Oxford Street
Stubington, Alfred . .	17, Strand
Summers, Samuel . .	4, Wellington Street, London Bridge
Swanwick, Francis . .	2, Queen's Row, Pimlico
*Tadman, Peter Lough .	198, Oxford Street
Taplin, Joseph . . .	172, New Bond Street
Taplin, Hugh B. . .	Ditto
Taylor, Clement . .	31, Upper Belgrave Place, Pimlico
Taylor, Henry . . .	9, New Bridge Street, Blackfriars
Taylor, John Thomas .	122, Pall Mall

Taylor, George . . .	31, Throgmorton Street
Thomas, William G. .	180, Strand
Thomas, Richard . .	Earl Street, Finsbury
Thomas, Charles W. .	16, Newgate Street
Thomas, Richard W. ,	78, Gracechurch Street
Thompson, Henry A. .	Hackney
*Thompson, Morley . .	22, Paul's Terrace, Ball's Pond
Tomlinson, Charles K. .	95, Bishopsgate Street
Topham, William . .	187, Bishopsgate Street Without
*Townsend, Charles . .	40, Aldersgate Street
*Townson, Thomas . .	2, Plough Court
Trego, James	159, High Street, Borough
Tuck, Charles . . .	Ratcliffe Highway
Tucker, Charles . . .	27, Aldgate
Tuke, William Murray .	15, Sloane Square, Chelsea
Turner, Edward H. . .	254, High Street, Borough
Turner, John	146, Holborn Bars
Turner, Richard . .	27, Coventry Street
*Uppleby, Henry . . .	140, Leadenhall Street
Waites, Henry . . .	106, Edgeware Road
Walford, Augustus D.C.	56, Cotton Street, Poplar
Walker, Henry . . .	41, Moorgate Street
Walker, Edward G. .	35, Skinner Street, Somers' Town
Walmsley, Thomas S. .	68, Fleet Street
Waller, Arthur . . .	28, Lambs' Conduit Street
Ward, Francis . . .	372, Oxford Street
Ward, Stephen . . .	79, Bishopsgate Street
Wardell, Henry . . .	6, Giltspur Street
Warin, James . . .	41, Blackman Street
*Warner, Richard . .	5, Old Fish Street
Warner, Henry . .	86, Bond Street
Warner, Charles H. .	Army Laboratory, Great Rider Street
Wastie, Francis . . .	2, Kennington Cross
Watts, William . . .	81, Connaught Terrace
Watts, Henry W. . .	125, Oxford Street
Weavers, Thomas . .	Ratcliffe Highway
Weir, Ellis	20, Bucklersbury
Welch, Charles . . .	49, Bethnal Green Road
*West, Charles . . .	5, Bridge Street, Westminster
Westall, Richard . .	12, Kensington Terrace, Gravel Pits
White, Timothy . . .	Dowgate Wharf
White, Robert . . .	2, Wilderness Row
White, John Haines .	Bond Street
White, Edmund . . .	19, Park Terrace, Regent's Park
Wilkinson, Thomas .	270, Regent Street
Williams, John . . .	19, Southampton Row

Willing, George . . .	29, Munster Street, Regent's Park
Willison, Wm. Henry .	43, High Street, Kensington
Willmott, William . .	83, High Street, Borough
Willmott, Charles . .	Ditto
Wilson, Thomas . . .	
Wilson, F. G. . . .	93, Cheapside
*Windus, Arthur Edward	180, Strand
*Winstanley, Hen. Geo.	7, Poultry
Wonfor, Joseph . . .	22, Conduit Street
Wood, John	48, Church Street, Bethnal Green
Wood, Nathaniel . .	172, Bond Street
Woodthorpe, C. W. .	2, Crucifix Lane, Bermondsey
Worrall, John . . .	95, Bishopsgate Street
Worsley, Richard . .	4, Grafton Street East
Wray, Thomas . . .	5, Old Fish Street
Wright, George Henry	24, Park Terrace, Regent's Park
Wright, Charles S. . .	226, Blackfriars' Road
Wright, Charles Guest .	Falcon Square
Wright, Martin Taylor .	213, Upper Thames Street
Wrightson, Francis C. .	Fore Street
Wylde, John	11, Sol's Row, Hampstead Road
Wylde, James . . .	42, Whitechapel Road
Wyllie, Edmund . .	22, Conduit Street
Youd, George . . .	34, Harleyford Place, Kennington
Young, George W. H.	19, Cold Bath Square
Young, Frederick . .	Ditto
Young, Robert . .	95, Bishopsgate Street

TOWNS.		RESIDING WITH
LONGTON, NEWCASTLE-UNDER-LINE	Ingar, George . .	
	Watkin, William . .	
LOUGHBOROUGH .	Bush, John Allen .	Mr. Redfern
LOUTH	Brigham, William . .	Mr. Robson
	Carritt, William . .	Johnson & Pearson
	Seagrave, George . .	
	Searle, George John .	
	Whelpton, Robert . .	
	Wood, W. D. . .	Mr. Robson
LOWER TOOTING .	Metcalf, Ebenezer . .	
LUDLOW	Cooke, Edward . . .	Mr. Marston
	Crompton, Wm. Penn	Ditto
	Crompton, Rob. Fabian	Mr. Cocking
	Hardy, Charles Johnson	Mr. Grounds
	Phillips, Robert . .	Ditto
	Wayn, Philip . .	Mr. Foster

TOWNS.		RESIDING WITH
LUTON	Bally, Edward . . .	Mr. Phillips
	*Burgess, W. H. . .	Ditto
	Clarke, Frederick . .	Ditto
LUTTERWORTH . .	Brown, Thomas . .	Mr. Gulliver
	Gulliver, William . .	Ditto
LYME REGIS, DORSET	Marder, John James W	
LYNN	Allen, Henry Wake .	Mr. Bayes
	Cardwell, Samuel . .	Ditto
	Dunger, John . .	Ditto
	Harris, Wm. Thos. Jas.	Mr. Parlett
	Langford, Wm. Henry	Mr. Langford
	Walton, George Robert	Mr. Bayes
MACCLESFIELD . .	Carr, John	Mr. Wilkinson
	Hardern, Charles . .	
	Jackson, George . .	Mr. Hadfield
	Kitchen, John . .	
	*Lean, Thomas . .	
	*Lean, James Charles .	
	Smallwood, John W. .	
	Wright, George Warren	
MAIDENHEAD . .	Brand, Thomas W. .	Bishop and Bellis
	Earle, Joseph . .	Mr. Shackel
	Field, George . .	Mr. Brigg
	*Poulton, John . .	Mr. Higgs
	*Walker, Robert .	Ditto
	*Withers, Richard .	Ditto
MAIDSTONE . . .	Akehurst, John . .	Mares, Argles, & Co.
	Barling, Charles V. .	Ditto
	Briers, Thomas . .	Mr. Knowles
	Buck, George . .	Messrs. Wimble
	Burcham, Joseph .	Mr. Smith
	Death, John William .	Mares and Co.
	Duke, William B. .	Ditto
	Evenden, Samuel S. .	Ditto
	Gibbs, William .	Mr. Prance
	Gregson, Jesse . .	Mares and Co.
	Hazell, Robert . .	Mr. Prance
	Knowles, Richard John	Mr. Knowles
	Lloyd, James S. . .	Mares and Co.
	Mares, William . .	Ditto
	Porter, William Henry	Mr. Prance
	Richardson, Alfred .	Mr. Knowles
	Roberts, George . .	Mr. Prance
	Stoffell, Henry . .	Mares and Co.
	Thorp, Thomas . .	Mr. Smith

TOWNS.		RESIDING WITH
MAIDSTONE . . .	Watts, Henry . .	Mr. Wimble
	Wickham, William .	Mr. Buchanan
	Wildish, Wm. Valentine	Messrs. Wimble
MALDON	Bulley, Henry . .	
	Green, Charles Owen .	
	Green, Robert Poynter	
MALMSBURY. . .	Gillard, Thomas . .	Mr. Walker
	Messiter, Charles D. .	Ditto
	Walker, John . .	Ditto
	*Walker, jun., William	Ditto
	Wood, Henry . .	Ditto
	Warren, William . .	Ditto
MALVERN . . .	Fox, Charles James .	Mr. Smart
	George, Fred. Benjamin	Ditto
MANCHESTER . .	Allen, William . .	Mr. Simpson
	Barker, Edward Nathan	Mr. Howard
	Barker, jun., Robert .	Mr. Barker
	Barnes, John . . .	Mr. Pickup
	Bates, Henry . .	Mr. Woodall
	Brown, W. J. . .	Mr. Jewsbury
	*Bufton, Edward .	Mr. Jackson
	Carter, Edwin . .	Mr. Woolley
	Carter, William . .	Lynch & Butterworth
	Cheshire, John . .	Mr. Barker
	Dearden, John . .	Mr. Woolley
	Dickenson, Wm. Leeson	Mr. Hargreaves
	Drinkwater, Henry John	Mr. Taylor
	Fairhurst, Thomas .	Mr. Bowker
	Finch, Ebenezer .	Mr. Wright
	Foden, Thomas . .	Mr. McWilliams
	France, Frederick .	Mr. Simpson
	Gethen, William .	Ditto
	Goadsby, Edward .	Mr. Goadsby
	Graham, Tho. Ashcroft	Mr. Barker
	*Green, Robert . .	Mr. Mayson
	Hall, Joseph . .	
	Halstead, Henry . .	Mr. Birks
	Haworth, David .	Mr. Danson
	Heslop, Robert . .	Mr. Bamford
	Heynes, John . .	Mr. Holyoake
	Holt, Isaac . .	Mr. Cooke
	Hopwood, Jas. Pilling .	Mr. Jewsbury
	Jack, Robert . .	Mr. Nielson
	Jackson, Robert . .	Mr. Woolley
	Jennings, William P. .	Mr. Wright

TOWNS.		RESIDING WITH
MANCHESTER . .	Keene, Alfred . .	Mr. Lynch
	Keyworth, Henry Nell .	Cartman & Woolley
	Mummery, Robert G.	
	Musson, Telemachus G.	Mr. Woolley
	Mawson, Charles . .	Mr. Mottershead
	Mitchell, John . .	Mr. Lett
	Mossley, Charles .	Mr. Bowker
	Oulton, Robert . .	Mr. Bowker
	Pickup, Varey . .	Mr. Pickup
	Race, Charles Bartlett	Mr. Race
	Ramsbottom, James .	Mr. Lynch
	Ransome, Thomas . .	Mr. Simpson
	Reay, Philip . .	
	Reddish, John . .	Mr. Darling
	Riley, Joseph . .	Mr. White
	Roberts, Edward . .	Mr. Mottershead
	Sharples, George . .	Mr. Danson
	Stone, Charles Peter .	Mr. Barlow
	Swindells, Frederick M.	Mr. Ingham
	Thomas, John Egerton	Mr. Standring
	Thompson, Robert .	Mr. Woodall
	Walker, William H. .	Mr. Jewsbury
	Whitworth, John .	Mr. Mottershead
	Wild, William . .	Mr. Standring
	Wilde, Eli . . .	Mr. Tootal
	Wilkinson, Mence .	Mr. Taylor
MARGATE . . .	FinchamCharles T., .	Mr. Fincham
	Quested, George .	Mr. Quested
	Williams, Henry Adam	Mr. Pickering
	Wootton, jun., William	Mr. Wootton
MARKET DEEPING	Holland, William .	
MARKET HARBRO'	Lovegrove, Thomas .	
	*Martin, R. F. .	Mr. Shepard
	Meadows . .	
MARKET RASEN .	Casterton, John D. M.	Mr. Casterton
	Strawson, Henry . .	Ditto
MASHAM	Hardcastle, Thomas .	
	Selley, William . .	
	Thompson, John .	
MELTON MOWBRAY	Allen, Adam Underwood	Mr. Ellaby
	Gray, William . .	Ditto
	Leadbetter, Wm. Austin	Ditto
MIDHURST, SUSSEX	Mercer, John . .	
MOLD	Williams, Thomas .	Mr. Birch

TOWNS.		RESIDING WITH
MONMOUTH . . .	Bowen, W. . .	Mr. Taylor
	Dawe, Sampson .	Messrs. Dawe
	Jones, Edwin . .	Mr. Cossens
NAILSWORTH . .	Smith, William . .	Mr. Smith
NANTWICH . . .	Gillard, Henry . .	Mr. Cartwright
NETHERSTONEY .	Ham, John . . .	
NEWARK	Baxter, John H. . .	Mr. Caparn
	Blundstone, John .	Ditto
	Calvert, Thomas . .	Mrs. Betts
	Harvey, John . .	Mr. Snow
	Ingledew, Thomas . .	Mr. Betts
	Kitchen, John . .	Mr. Snow
	Marshall, Thomas . .	Mr. Caparn
	Partridge, Henry .	Mrs. Betts
	Weddell, John . .	Ditto
NEWBURY . . .	Fielder, Thomas Waters	
	Johnstone, Bayntum .	Mr. Payne
	Ragg, William . .	Mr. Davis
	Sparshatt, Henry B. W.	Mr. Payne
	Young, Wm. Herbert .	Ditto
NEWCASTLE . .	Barker, Thomas . .	Taylor, Gibson & Co.
	Bell, Joseph . .	Ditto
	Belough, Henry B. .	Ditto
	Burnett, Jacob . .	Currie and Co.
	Copland, Thomas .	Daglish and Co.
	Dobson, John . .	Mr. Garnett
	Donkin, George . .	Mr. Tweedle
	Fairless, W. D. . .	Daglish and Co.
	Fawcett, Benjamin .	Mr. Challoner
	*Foster, Christopher .	Mr. Gilpin
	Garbutt, John . .	Mr. Garbutt
	Gibson, jun., William .	Currie and Co.
	Gibson, B. . . .	Ditto
	*Gilpin, Benjamin . .	Mr. Gilpin
	*Gilpin, Robert Spencer	Ditto
	Gledson, Thomas .	Mr. Headley
	Greenwell, Wm. Croser	Mr. Garbutt
	Hall, Thomas . .	Mr. Turner
	Howson, J. T. . .	Mr. Coleman
	Jones, James . .	Mr. Potts
	Lee, Matthew . .	Taylor, Gibson & Co.
	Liddell, Henry . .	Ditto
	Maling, William . .	
	Mann, Henry . .	Mr. Coleman

TOWNS.		RESIDING WITH
NEWCASTLE . . .	*Mann, Robert . .	Daglish & Co.
	Mattinson, Thomas .	Mr. Challoner
	Porter, James . .	Currie and Co.
	Procter, William . .	Mr. Procter
	Procter, John . .	Ditto
	Ramsay, Charles . .	
	Rothwell, James P. .	Mr. Fairs
	Russell, Henry . .	Mr. Russell
	Shaw, James . .	Mr. Fairweather
	Slater, Joseph . .	Daglish and Co.
	Southern, S. (Usworth)	
	Thompson, William .	Taylor, Gibson & Co.
	Turnbull, R. . .	
	Urwin, John . .	Daglish and Co.
	Weir, James Anthony .	Mr. Nayler
	Wilson, Henry . .	Taylor, Gibson & Co.
	Wood, George . .	Ditto
	Wood, Gabriel . . .	Mr. Challoner
NEWMARKET . .	Taylor, Henry . .	Mr. Rogers
	Westley, Francis . .	Ditto
NEWPORT PAGNELL	Burns, Robert . .	Mr. Taylor
NEWPORT, SALOP . .	Hitchcox, William .	
NEWTON ABBOT .	Lamacroft, William .	Mr. Maine
NEW YORK, U. S. .	Higgins, John . . .	
NORTHALLERTON .	Dixon, Thomas . .	
NORTHAMPTON . .	Atterbury, Richard .	Miss Lucas
	Bennett, Isaac M. .	Mr. Arnitt
	Burbidge, J. . .	Perrin and Co.
	Edens, John . .	Mr. Harris
	Flint, H. W. . .	Perrin and Co.
	Osborne, Henry . .	Messrs. Greville
	Pochin, Henry Davis .	Mr. Harris
	Palmer, T. D. . .	Perrin and Co.
	Walker, Frederick .	Messrs. Greville
NORWICH . . .	*Aldred, Charles . .	(*Deceased*)
	*Batley, James . .	Palace Street
	Belson, Richard Bell .	Mr. Arnold
	Bensley, George David	Mr. Pitt
	Cobb, John . .	Mr. Arnold
	Coble, John Nickerson	Mr. Grimmer
	Cooke, William . .	Mr. Fitch
	Cooper, John . .	Mr. Aldred
	Cubitt, Elmer . .	Mr. G. Cubitt
	Deacon, Geo. Frederick	Mr. E. Arnold
	DeCarle, Jos. Parkinson	Mr. Cubitt
	*Fitch, Robert . .	Market Place

TOWNS.		RESIDING WITH
NORWICH	Gleed, Ellis . .	Smith and Son
	Godfery, Thos. Catton	Mr. Cubitt
	Gowing, Joseph . .	Mr. Spatchett
	Harper, George . .	Mr. Grimmer
	Hartt, Walter William	Mr. Hartt
	Howkins, Lionel . .	Mr. Fromow
	Johnson, James Lee .	Mr. Woolner
	Lay, William Robert .	Mr. R. Bass
	Maynard, R. H. . .	Mr. Fromow
	*Moore, James Brett .	Brigg Street
	Pitts, Rob. Christopher	St. Giles
	Priest, Robert Raven .	Ditto
	Rackham, Thos. John Carter . . .	Mr. Johnson
	Reeve, Isaac John .	
	*Rudd, John . .	Bridge Street
	Simpson, Frederick .	Mr. Rosse
	Skepper, Edmund .	Smith and Son
	*Smith, Richard Buck .	Magdalen Street
	Smith, William Lyall .	All Saints
	*Sothern, George . .	Market Place
	Spatchett, James .	Madder Market
	*Stacy, William Smith .	St. Simons
	Suckling, Benj. William	Mr. G. Sothern
	Swann, Edward . .	Mr. Thompson
	Taylor, Cubitt James .	Mr. Case
	Taylor, Edward . .	White Lion Street
	*Thompson, Henry .	St. Stephens
	Thompson, Arth. Charles	Mr. Cross
	Wells, Alfred . .	Mr. Priest
	*Woolner, John . .	St. Andrews
NOTTINGHAM . .	Dudgeon, George . .	Mr. Chapman
	Ellicock, Joseph . .	Mr. Williams
	Gale, Henry . . .	Mr. Wains
	Goff, Henry . .	Mr. Cheetham
	Hernage, Henry James	Mr. Attenborough
	Hutchinson, Alfred .	Mr. Gelsthorp
	Ingram, Jeremiah . .	Mr. Shelton
	Marsh, Joseph Thomas	Mr. Large
	Norweb, Beecham . .	Mr. Coltman
	Oakland, William .	Mr. Beardsley
	Parr, Samuel . .	Mr. Cheetham
	Prince, Henry . .	Ditto
	Shepperley, James .	General Hospital
	Stevens, John . .	Mr. Cheetham

TOWNS.		RESIDING WITH
NOTTINGHAM . .	Tomlinson, Thomas .	Mr. Coltman
	Whinfield, William H.	Mr. Williams
	Wood, James . .	Mr. Hedderly
	Wright, William .	Mr. Hedderly
OAKHAM	Ordoyno, Thomas . .	Mr. Mackender
OLDHAM . . .	Barlow, Henry . .	Mr. Cocks
	Brelsford, Mark . .	Mr. Brelsford
	Buckley, Daniel . .	Ditto
	Goodman, Samuel .	Ditto
	Hargraves, Henry Lister	Mr. Hargraves
	Holt, John . . .	Mr. Hudson
	Lees, Thomas . .	Mr. Cocks
	Wood, James . .	Mr Wood
ORMSKIRK . . .	Kershaw, Thomas .	Mr. Kershaw
OXFORD	*Boulter, James . .	Mr. Thurland
	Evans, Charles J. .	Mr. Brown
	Grange, James . .	Ditto
	Foster, G. P. . .	Mr. Chapman
	Howson, T. Broughton	Mr. Miller
	Kimber, John . . .	Mr. Luff
	Loder, John Lamplow .	Mr. Telfer
	*Marchant, Charles Fred.	Mr. Cousins
	Prior, George . .	Mr. Brown
	Taylor, Thomas Palmer	Mr. Hitchcock
	Tustin, Thomas Henry .	Ditto
	West, Isaac . .	Ditto
	Withers, John . .	Mr. Walsh
PENDLETON . . .	Dean, Thomas . .	Mrs. Barber
PENRITH . . .	Fawcett, William . .	
	Hobson, W. G. . .	
	Irving, William . .	Mr. Burthwick
	Kirkbride, W. . .	
	Ramsay, Joseph . .	
PENZANCE . . .	Symons, jun. . . .	
PETERBOROUGH .	Ball, Thomas Mugliston	Mr. Sturton
	Heritage, William .	
	Hildyard, S. F. . .	Mr. Sturton
	Savigar, Frederick John	Ditto
	Simmons, John Sheen .	Mr. Whitwell
PLYMOUTH . . .	Austin, John Colmer .	Messrs. Balkwill
	Baldy, William Curtis .	Mr. Soper
	Ball, Robert Hawker .	Ditto
	Bowhay, James Elliott .	Ditto
	Burt, Frederick . .	Mr. Rowe
	Crocker, Edwin . .	Messrs. Balkwill
	*Dawes, Richard . .	Mr. Mennie

TOWNS.		RESIDING WITH
PLYMOUTH . . .	Day, Joseph Ashe . .	Mr. Vicary
	Ellis, Andrew . .	Mr. Soper
	Fenwick, Robert . .	New York
	Geldard, John . .	Mr. Geldard
	Hinton, Charles Fox .	
	Ling, Edwin . . .	Mr. Smith
	Love, Charles . .	Mr. Pearce
	*Parsons, John Henry .	Mr. Mennie
	Paynter, George . .	
	Ream, William Henry .	Messrs. Balkwill
	Saunders, Thomas .	Mr. Smith
	Tarzewell, Richard .	Mr. Rowe
	*Tracy, William . .	Mr. Mennie
	Walke, Andrew . .	Mr. Gibbons
PONTEFRACT . .	Arnall, Thomas . .	Mr. Brice
	*Taylor, William . .	Ditto
	Tinker, Charles James .	Ditto
PONTYPOOL . . .	Hayward, Samuel H. .	Messrs. Wood
POOLE	Hamilton, Julius . .	Mr. Hamilton
PORTSEA . . .	Gilbert, G. . .	Mr. Mallory
	Hayter, Samuel Tracy .	Mr. Orange
	*Malpas, F. . . .	
	Mogg, George Ethersey	Mr. Rastrick
	Olding, George Hill .	Mr. Warren
	Pearce, Jn. Spicer Deane	Mr. Tryon
	Perfect, George . .	Mr. Mallory
	Wheeler, James Edward	
PORTSMOUTH . .	Canes, Edward Henry	Mr. Luscomb
	Parsons, William . .	Mr. Collins
PRESCOTT . . .	Edwards, William . .	Mr. Kershaw
	Hargreaves, Hudson .	Ditto
	Tyrer, Joseph . .	Ditto
PRESTON	*Alman, Francis . .	Mr. Armstrong
	Bolton, Rogers . .	Mr. Cowell
	*Copeland, John . .	Mr. Copeland
	Fowler, James Baker .	Mr. Raw
	Howarth, Robert .	Ditto
	Jackson, Edward .	Mr. Barnes
	Lewis, John . .	Ditto
	Taylor, Jas. Hawarden	Mr. Taylor
	Taylor, Sydney . .	Mr. Raw
PWLLHELI . . .	Morris, Isaac . . .	Mr. Williams
	*Owen, Thomas . . .	
	Williams, Philip . .	Mr. Williams
RAMSGATE . . .	*Clendon, jun., George .	Mr. Clendon
	Gaskell, William . .	Mr. Fisher
	Jackson, Richard . .	Mr. Gibson

TOWNS.		RESIDING WITH
RAMSGATE . . .	*Sawyer, Henry . .	Harbour Street
RAMSAY, ISLE OF MAN	Hargreaves, Fred. Hunt	Mr. T. Clarke
RAYLEIGH, ESSEX .	Blakeley, T. . .	Mr. Kernot
	Kernot, George Charles	Ditto
READING . . .	Bishop, A. L. . .	Mr. Morphew
	Bosley, Jonathan G. .	Mr. Hodson
	Collier, William . .	Mr. Poulton
	Cooper, Lewis . .	Mr. Cooper
	Corbold, Alfred . .	Mr. Bolton
	*Hassall, John Thomas	Mr. Hodson
	House, William Frank	May & Brown
	Laurie, Buxton . .	Mr. Morphew
	Malone, Thomas . .	Ford and Sons
	Miller, Robert Parsons	Ditto
	Phillipson, Thomas .	Mr. Poulton
	Rutherford, Charles .	Mr. Morphew
	*Williams, Henry Edwin	
REDDITCH . . .	Loudon, Henry . .	Mr. Brown
	Pearman, Henry . .	Ditto
REIGATE	Vincent, Philip . .	Mr. Forbes
RETFORD . . .	Bellwood, John . .	Mr. Baker
	Fox, Alexander . .	Ditto
RICHMOND, SURREY	Bell, Wm. Henderson	Mr. Lloyd
	Main, William . .	Ditto
	Wright, Samuel . .	Mr. Harding
RICHMOND, YORKSHIRE . . .	Husband, Matthew .	Messrs. Ward
	Kendall, G. . . .	Mr. Adamthwaite
	Simpson, William . .	Mr. Raw
	Ward, James . .	Messrs. Ward
RINGWOOD . .	Dale, Henry . .	Mr. Massey
RIPON	Potter, Charles . . .	Mr. Chapman
	Richardson, George .	Mr. Judson
	Walbran, Thomas . .	Mr. Greaves
	Watson, Thomas . .	Ditto
ROCHDALE . .	Barber, George . .	Mr. Booth
	Crossley, Edmund .	Mr. Howarth
	*Dickin, Joseph P. . .	Mr. Booth
	Green, George . .	Mr. Green
	Holdsworth, George .	Mr. Taylor
	Jackson, John . .	Mr. Rayner
	Leech, Thomas . .	Mr. Leech
	Marshall, George .	Mr. Rothwell
	Williamson, Joseph .	Mr. Rayner
ROCHESTER . .	Aveling, James Hobson	
	Colman, Friend . . .	
	Theobald, Peter . .	

TOWNS		RESIDING WITH
Rochford . . .	Raynham, Henry .	
Ross	Roper, Thomas . .	Mr. Cox
Rotherham . .	Outwin, Thomas . .	Mr. Haywood
Rugby	White, Joseph . . .	Mr. Garratt
Rugeley . . .	Thurlby, Benjamin .	Mr. Salt
	Ward, Joseph . .	Fowke&Greensmith
Ruthin . . .	Jones, Abel . .	Mr. Evans
	Prytherck . .	
	Roose, Robert . .	Ditto
Ryde, I. W. . .	Jenkins, Henry H. .	
	Peat, William Henry .	Mr. Peat
	Phillips, William . .	Mr. Lowe
	Ryland, D. B. . .	George Street
Rye	Stonham, Thomas G. .	Mr. Plomley
Saffron Walden	*Miller, Charles B. .	Mr. Miller
	Overton, John . .	Mr. Burrows
	Winder, William .	Ditto
Salisbury . . .	Bailey, Edward . .	Mr. Squarey
	Bennett, T. . .	Mr. Farrant
	Cusse, Charles . .	Ditto
	Dowland, James Edw.	Ditto
	Huxtable, William .	Ditto
	Sharp, Henry . .	Mr. Buckell
	Swinford, James .	Mr. Squarey
	Walton, George Henry	Mr. Farrant
Salford . . .	Arrowsmith, William .	
	Bamford, James . .	
	Cooper, Matthew .	Mr. Sharpe
	Johnson, Thomas .	
	Pogmore, John . .	
	Snelham, Frederick G.	Mr. Sharpe
	Whittaker, Ellis . .	Ditto
Sandgate . . .	Frampton, Wm. Jenner	
	Jenner, W. Messenger	
Sandwich . . .	Knowles, John James .	Mr. Knowles
Shaftesbury . .	Cornish, Henry Roberts	Mr. Powell
Sheffield . . .	Bates, William S. .	Mr. Hill
	Blunn, Samuel . .	Mr. Greaves
	Brown, Thomas . .	Mr. Smith
	Cockayne, Henry .	Mr. Jervis
	Foers, George Frith .	Mr. Merryweather
	Hick, Allan . .	Mr. Radley
	Jennings, John, E. H.	Mr. Machon
	Leslie, Joseph . .	Mrs. Lester
	Lester, John . .	Ditto
	Lowe, Thomas . .	Mr. Machon

TOWNS.		RESIDING WITH
Sheffield . . .	Maunder, Frederick .	Mr. Smith
	Portway, John . .	Mr. Taylor
	Roper, William Greaves	Mr. Roper
	Sales, Joseph Henry .	Mrs. Owen
	Skidmore, John .	Mr. Slack
	Tilburn, Robert James	Mr. Horncastle
	*Whitehead, Edwin .	Mr. Radley
	Wilkinson, John .	Mrs. Wilkinson
Shelton Staff. Potteries . .	Henshall, Samuel .	Mr. Pierce
Sherborne, Dorset	French, William . .	Mr. Longman
	Hawkins, Richard . .	
	Rendall, John . .	
	Rundle, Henry . .	Mr. Rawlings
	Stephens, John . .	Mr. Longman
	Williams, Joel D. .	Ditto
Sherston, Wilts .	Richards, Martin .	
Shields, North .	Appleby, Henry Parkin	Ogilvie and Son
	Bamford, Edmund .	Mr. Williamson
	Clennell, John M. .	Ogilvie and Son
	Dacres, William . .	Mr. Barker
	Gordon, John . .	Ditto
	Patton, John . .	Ogilvie & Son
	Robinson, John A. .	Ditto
	Williamson, John .	Mr. Williamson
Shields, South .	Jefferson, Wm. Francis	Bell and May
	Smith, Edward . .	Mr. Hudson
	Turnbull, Edw. Robson	Bell and May
	Walker, John R. .	Mr. Walker
	Young, George . .	Bell and May
Shipley . . .	Savage, Thomas .	
Shrewsbury . .	Anderson P. . .	
Sittingbourne .	Butler, Benj. Atwood	Mr. Gordelier
	Furmston, Sam. Charles	Ditto
Skipton . . .	Webster, George .	
Smethwick, near Birmingham .	Marshall, Richard . .	Mr. Brindley
Southampton . .	Adkins, William . .	Mr. Randall
	Bartlett, William Hugh	Mr. Tryon
	Cayme, Robert William	Mr. Palk
	Cobden, Alfred Fleming	Mr. Randall
	Day, Abraham . .	Ditto
	Dowling, Wm. Francis	Mr. A. Mordaunt
	Dowman, George .	Mr. Randall
	Durking, James George	Mr. J. Mordaunt
	Fyvie, Edward . .	Mr. Randall

TOWNS.		RESIDING WITH
SOUTHAMPTON . .	Guyer, Thomas S. .	Mr. Randall
	Langfield, John F. .	Mr. Steere
	Morris, Maynard .	Ditto
	Notcutt, William . .	Mr. Randall
	Parsons, John H. .	Mr. Palk
	Poulter, John Arthur .	Mr. Glaisyer
	*Randall, William B. .	Mr. Randall
	Rame, James . .	Mr. Glaisyer
	Roe, Septimus . .	Mr. Palk
	Toms, John . .	Mr. Randall
	Walker, John . .	Ditto
	White, George . .	Ditto
SOUTHPORT . . .	Garside, Burdett	
SOUTHSEA . . .	Baker, Thomas Brown	Mr. Mitchell
SPALDING . . .	Longstaff, John .	Mr. Shadford
SPILSBY	Overton, John Smith .	Mr. Rainey
STAFFORD . . .	Fowke, George . .	
	Fowke, Edward Thomas	
	Goodwin, Owen . .	
	Hawthorn, John Harris	
	Jones, Wm. Atcherley	
	Nosworthy, William .	Mr. Dawson
	Robotham, John . .	Ditto
	Wells, Henry .	
	Wootton, William .	
STAINES . . .	Knight, Joseph . .	Mr. Slark
ST. ALBANS . . .	Harris, George . .	Mr. Lewis
STAMFORD, LINCOLNSHIRE . .	Allen, Abraham Hack .	Mr. Horner
ST. ASAPH . . .	Glynne, Edward O. .	Mr. Davis
ST. HELENS . .	Addison, John . .	
	Liptrott, John . .	
	Waterworth, John .	
ST. IVES	Harradine, Charles .	Mr. Stocker
	Humbly, William .	Ditto
	Vere, Dennis . .	Mr. Prior
ST. LEONARDS . .	Leach, Peter . .	Mr. Murton
	Betts, James Holman .	Neuzam & Althorpe
STOCKPORT . .	Bayley, Francis . .	Mr. Walker
	Brown, John . .	Mr. Shawcross
	Foulkes, Wm. James .	Sims & Shaw
	Spragg, Samuel . .	Mr. Taylor
	Thomas, Richard .	Sims & Shaw
	Woolley, Daniel . .	Ditto
	Younghusband, Wm. .	Mr. Taylor
STOCKTON . . .	Hutchinson, James .	Mr. Dodshon

TOWNS.		RESIDING WITH
STOCKTON	Readman, Henry . .	Mr. Dodshon
STONE, NEAR WOLVERHAMPTON .	Woolrich, Thomas .	
STONEHOUSE . .	*Herron, Fred. Thomas	Mr. May
STOURBRIDGE . .	Bland, jun., Jn. Handel	Mr. Bland
	*Blundell, James . .	Mr. Freer
	*Couch, Wm. Oakley .	Mr. Hassall
	Morris, Alfred P. .	Mr. Morris
	*Wise, Thomas . .	Mr. Hassall
STOWMARKET . .	Richardson, F. A. .	Mr. Cutting
STRATFORD ON AVON	Dingley, R. L. . .	Mr. George
STROOD, KENT .	Tamplin, A. . .	Mr. Martin
STROUD	Baylis, Frederick .	Mr. Gay
	Parker, Henry . .	Mr. Bateman
	Tombs, Thomas . .	Ditto
STUDLEY, NEAR BIRMINGHAM . . .	Matthews, Edward . .	Mr. Brown
SUNDERLAND . .	Brunskill, Joseph .	Ritson and Sons
	Meldrum, Alexander .	Mr. Marshall
	Robson, Thomas .	Mr. Dobinson
	Simons, William V. .	Ritson and Sons
	Simons, R. W. . .	Mr. Simons
	Tulley, James .	Mr. Marshall
	Walton, John . .	Mr. Walton
SUTTERTON, NEAR SPALDING. . .	Barton, Charles	
SUTTON COLDFIELD	Callow, Martin . .	Mr. Smith
SWAFFHAM . . .	Sutterby, Jonathan N.	Mr. Finch
	Sutton, William . .	Ditto
SWANSEA . . .	Dawe, Thomas . .	Dawe & Son
	*Griffiths, Benjamin .	Ditto
	Morgan, Daniel . .	Mr. Pearson
	*Pillman, H. M. . .	Dawe & Son
SWINDON . . .	*Phelps, Wm. Rowswell	Mr. Wheeler
SWINESHEAD . .	Smith, Ebenezer . .	
SYDNEY	Gale, Samuel . .	
TAUNTON . . .	Banfield, Harold .	Mr. Joyce
	Conway, Robert . .	Mr. Coker
	*Hammet, John . .	Mr. Hitchcock
	Palmer, Samuel . .	Mr. Hitchcock
	Pratt, Edward . .	Mr. Lyddon
	Smith, James Singer .	Mr. Joyce
	Sweetapple, Thomas .	Mr. Cox
	Williams, J. . . .	Williton
TAVISTOCK . . .	Bolt, W. H. . .	Mr. Bolt
	Brendon, W. E. . .	

TOWNS.		RESIDING WITH
TENBY	Merrick, Thomas . .	Mr. Freeman
TENTERDEN, KENT	Weston, Henry . .	Mr. Smith
TEWKESBURY . .	Ellis, Robert Watkins .	Mr. Durfield
THAME	Simmons, jun., W. H.	
THAXTED, ESSEX .	Haslam, Simeon . .	
THIRSK	Addison, Edward .	Mr. Foggitt
	Crompton, Samuel .	Ditto
	Mackereth, H. W. .	Mr. Thompson
	Reed, George . .	Mr. Foggitt
	Rutter, Hervey Augus.	Mr. Coates
	Talbraham, J. W. .	Mr. Foggitt
	Thompson, Thomas .	Mr. Thompson
	Windross, Joseph .	
THORNEY . . .	Dodman, Robert . .	Mr. Dodman
THRAPSTON . . .	Pratt, Edmund . .	Mr. Stanton
TICKILL, NEAR MANCHESTER . . .	Lichfield, Henry . .	Mr. Crowther
TIPTON	Cope, Thomas Septimus	
	Taylor, Joseph . . .	Mr. Briggs
TIVERTON . . .	Beedale, Thomas . .	Mr. Merson
	*Coker, William . .	
	Goodridge, M. . .	Mr. Sanders
	*Griffiths, Thomas H. .	Mr. Merson
	Long, W. Thomas . .	
TORQUAY . . .	Hearder, William .	
	Stark, William . .	
TORRINGTON . .	Lewis, Edward . .	Mr. Handford
	Row, jun., John . .	Mr. Row
TORRINGTON, GREAT	Fowler, Henry . .	
TOTNESS	Shapter, John Tucker	Mr. Trehane
TOTTENHAM . .	Bishop, Thomas . .	
	Bwye, G.	
	Goldsmith, John . .	
	Wall, James . .	
	Wright, James J. .	
TOWCESTER . . .	Tite, Samuel Cooper .	
TRURO	Akerman, John Wm.	Mr. James
	Bryant, James Henry	
	Stansmore, Charles .	Mr. James
TUNBRIDGE . . .	Willmer, Lewis M. .	Mr. Evenden
TUNBRIDGE WELLS	Davies, William .	
	Linn, . .	
	Phillip, Henry . . .	
ULEY, NEAR DURSLEY	Leach, Joseph . .	Mr. Kathro
	Osborne, Daniel .	

TOWNS		RESIDING WITH
Upton on Severn	Johnson, B.	
	Perrins, Enoch	Mr. Shuard
Uttoxeter, Staffordshire	Chawner, George	Mr. Benwell
	Flint, John	Mr. Woolrich
	Garle, William	Mr. Garle
Uxbridge	Lacy, Benjamin	Pullin & Chambers
	Maggs, Samuel	Ditto
Wadesmill, Herts	Evennett, John C.	Mr. Marsh
Wainfleet, Lincoln	Smith, Robert	Mr. Abraham
Wakefield	Atkinson, Charles	Mr. Gell
	Cockshott, William	Mr. Lawton
	Marshall, George	Mr. Alderton
	Nawton, William	Mr. Mountain
Wallingford	Mason, Charles	Mr Bartholomew
Walsall	Lloyd, Charles	Mr. Highway
	Richards, Francis	Ditto
	Wareham, George	Mr. Adams
Waltham Abbey	Perry, Francis	Mr. Mayhew
Warrington	Royston, William	Mr. Sharpe
Warwick	Garrett, William	Mr. Reading
	Obbinson, Thomas	Mr. Baly
	Underwood, John	Mr. Court
Watford	Hopley, Thos. Howard	Mr. Chater
Wath, Yorks	Flower, Thomas	Mr. Bishop
	Hirst, Thomas John	Ditto
Watlington	Bentham, Thomas	
Watton, near Norwich	Chaston, George	Mr. Chaston
	Matthews, William	Mr. Chaston
Wednesbury	Hobbins, William	
Welchpool	*Jones, Oliver	
Wellinborough	Donkell, James	Mr. Thorne
Wellington, Somerset	Dunn, John	
	Lock, Charles	
	Seward, George	
Wern, Salop	Hurley, W. P.	
	Owen, David	
West Malling	Steadman, R.	
Whitehaven	Magee, Richard	Longstaff, Randleson, and Foster
	Magee, Henry	
Wigan	Baldwin, William	
Willenhall, near Wolverhampton	Bird, John	
	Tebbett, Eli	
Wimbourne	Mitchell, Bossum, A.	Mr. Huntley
	Randall, Thomas	Ditto

TOWNS.		RESIDING WITH
WINCHESTER . .	Brownjohn, Wm. John	
	Dyer, Richard Henry .	
	La Croix, Henry Gill .	
	Moore, John David	Mr. Powell
	Powell, Thomas . .	Ditto
WINDSOR . . .	Matthew, Edward . .	
	McDermott, Wm. H. .	
	Weller, George . .	Mr. Foster
WOLVERHAMPTON .	Bailey, Henry . .	North Street
	Bannester, William T. .	Cock Street
	*Biddle, Henry . .	High Green
	Cecil, Joseph . .	Cock Street
	Collins, Charles F. . .	High Green
	Eagleton, Joseph .	North Street
	Fisher, George . .	Ditto
	Flint, John . .	Cock Street
	Hughes, John . .	Ditto
	Jackson, Robert . .	Dudley Street
	Lawley, Reuben . .	Cock Street
	Mainwaring, Richard .	
	*Miller, John . .	High Green
	Ratcliffe, John . .	Cock Street
	Sutton, George . . .	Ditto
	Sutton, jun., Thomas .	Queen Street
	Waldie, James . .	Cock Street
	Weaver, George . .	Ditto
WOODBRIDGE . .	Thompson, Thomas A.	Mr. Buckmaster
WOOLWICH . .	Berry, Edward . .	Mr. Stuart
	Chaplin, Samuel . .	Mr. T. Parkes
	Copeland, John . .	Mr. Judson
	Judson, Samuel Wilson	Ditto
	Naylor, Edwin Y.	Mr. H. Parkes
	Newington, Henry P.	Mr. T. Parkes
	Rastrick, George Thos.	Mr. Rastrick
WORCESTER . .	Acton, George . .	Mr. Anderson
	Baylis, Thomas . .	Mr. Moore
	Bird, W. B. . .	Farmer and Bird
	Bolton, William . .	Lea and Perrins
	Burrow, W. B. . .	Ditto
	Cook, Philip John .	Ditto
	Cope, R. . . .	Mr. Anderson
	Dawson, John . .	Mr. Homer
	Drew, John . .	Mr. Styles
	Gibbs, William . .	Farmer and Bird
	Lindars, W. . . .	Mr. Anderson

TOWNS.		RESIDING WITH
Worcester . . .	Mackay, John . .	Lea and Perrins
	Matthews, A. . .	Ditto
	Mould, Daniel . .	Moore & Whitfield
	Parker, George . .	Mr. Wood
	Stringer, J. . .	Moore & Whitfield
	Stuart, J. E. . .	Lea and Perrins
	Walker, J. S. . .	Ditto
	Wilkes, T. . . .	Farmer and Bird
Worksop . . .	Lowe, William Harrison	
Worthing . . .	*Wolferstan, Humphrey	Mr. Cortis
Wotton under Edge	Davies, Geo. Hamilton.	
Wrexham . . .	Hughes, Henry . . .	
	Johnson, Henry Smith	Mr. Johnson
	Johnson, Walter . .	Ditto
	Jones, Charles . .	Ditto
	Jones, E. T. . .	
	Parsonage, Henry . .	Mr. Beale
	Rowland, Thomas . .	
	Turner, John . .	Mr. Broughton
	Waring, William . .	Ditto
	Whitley, Edward . .	
	Williams, William . .	
Wycombe, High .	Allnutt, Henry . .	Butler and Son
	Button, John Elliott .	Ditto
	*Charsley, Nathaniel .	Ditto
	*Gregory, William . .	Ditto (Great Marlow)
	*Meadows, John Slater	Mr. Tuck
	*Shackle, George . .	Mr. Tuck
	*Soulby, Henry . .	Butler and Son (Beaconsfield)
Wymondham . .	Bayfield, Arthur . .	Mr Skoulding
	Boast, R. B. . .	Ditto
	Skoulding, William .	Ditto
	Smith, Goodwin . .	Ditto
Yarmouth, Norfolk	Bond, Charles . .	Mr. Bond
	Doughty, Miles Hubbard	Mr. Mabson
	Jones, William . .	Mr. Owles
	Silvers, Robert . .	Mr. Markland
	Smith, Charles . .	Mr. Bond
	Steward, William .	Mr. Steward
Yeovil	Collins, Edwin Stephens	Mr. Harvey
York	Bell, Thomas . .	St. Sampson's Square
	*Bingley, Thomas Gyles	22, Colliergate, *Sec.*
	Beckett, John . .	Goodramgate

TOWNS.		RESIDING WITH
York	Botterill, Edwin	Mr. Little
	Bowman, W.	22, Colliergate
	Brown, John	High Ousegate
	Carrick, James	Pavement
	*Clarke, Henry	22, Colliergate
	*Cooper, Thomas	Ditto
	*Cooper, Mark W.	Bridlington
	Davison, Ralph	Petergate
	Dutton, Edward	19, Castlegate
	Etty, William	18, Bridge Street
	Flower, John Gerrard	Pavement
	Harwood, jun., John	Petergate
	Hepton, William	13, Micklegate
	Hick, Henry	Goodramgate
	Holden, Richard	Pavement
	Horne, George	Ditto
	Hurworth, Thomas B.	Walmgate
	*Linsley, Thomas	Coney Street
	Manfield, Leonard	Goodramgate
	Nicholson, Samuel	Pavement
	Outhwaite, William	Ditto
	Parkinson, Robert	22, Colliergate
	Smith, Thomas	Scarbro'
	Steel, R. Jackson	Pavement
	Tate, John	57, Petergate
	Tonge, J. Scawin	Ditto
	Waller, Anthony	21, High Ousegate
	Whitwell, John	19, Castlegate
	Wilson, William	18, Bridge Street
	Wilson, J.	

PHARMACEUTICAL JOURNAL.

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ON THE PRESENT STATE OF PHARMACY IN ENGLAND.

Much has been said respecting the superior advantages possessed by Continental Pharmaciens over the Chemists and Druggists of this country, with regard to the education which they receive, and the regulations which are enforced for the protection of the public against unqualified persons. That there is some truth in these allegations cannot be denied, and it is to remedy the defects complained of, that the Pharmaceutical Society has been established. An opinion generally prevails, that we ought not only in practice, but also in theory, to aspire to that position as followers of a scientific art which our neighbours enjoy, and there is every reason to believe that this will eventually be accomplished.

Notwithstanding all the arguments which have been advanced, and the facts which have been stated in reference to the compulsory education prevailing in other countries, we cannot admit that Pharmacy is practically neglected in Great Britain. On the contrary, we believe, that in some respects, we are even in advance of our neighbours, and that there is no country in the world in which the commercial department of our business is conducted with greater attention and skill. We have visited a considerable number of shops, both at home and abroad, for the purpose of making observations on this subject, and we can testify that the system adopted on the Continent is not infallible. A Druggist in Belgium was lately applied to for sesquicarbonate of soda. He gave the (sub)carbonate in crystals, and confessed that he was not acquainted with any other kind. We have bought powdered rhubarb, jalap, and other simple drugs in France, Belgium, and Germany, and have in general found the samples decidedly inferior to those which may be obtained of respectable Chemists in England. But in England—whatever credit we enjoy is due to voluntary individual exertions, the attainment of the needful qualifications is altogether discretionary, there is no recognized standard to which all must aspire, nor have we any means of classifying our Pharmaceutists according to merit, or estimating the amount of benefit which each confers on his profession. If, even under these circumstances, we can

in any particular, lay claim to a superiority in practical Pharmacy, what may we not expect from the introduction of a system which will confer a professional character on a pursuit which is, to a considerable extent, followed merely as a trade?

The work having been undertaken by the Chemists themselves, and being confined to no particular district or class, but enjoying general support throughout the country, it is fair to conclude, that an almost universal desire for improvement prevails, and that those who have embarked in it are likely to carry it out.

But while the chief labour of the undertaking devolves on the parties more immediately concerned, the advice and assistance of others, who are also interested in the result, should at all times be appreciated, and every advantage should be taken of any suggestions which may be offered. Among the multifarious preparations and substances which are comprised in the stock of the Pharmaceutical Chemist, it is not to be expected that his mind can embrace at one time all the items in the catalogue, and every detail of management or manipulation which demands his attention. Hence we find that the industry of individuals is directed into different channels, and that each class of preparations, or substances, in the Materia Medica, furnishes a field of research in which their respective votaries aspire to especial distinction.

It is by this division of labour that the art and science of Pharmacy is most likely to progress, and that our stock of knowledge is enriched by the discoveries of those who concentrate their abilities in the prosecution of some particular range of study. Hence the late improvements which have taken place in the preparation of extracts, in the manufacture of salts, in the separation of essential principles, and in other operations of Pharmaceutical Chemistry. But while it is optional with each individual to choose as a hobby any branch of his business which he prefers, or for which he may be most qualified, the general supervision of the whole demands constant attention. The same care that is requisite in the manipulation of preparations which are prepared by the retail Chemist, is equally necessary in ascertaining the genuineness and purity of such articles, whether more or less compound, as are obtained ready for use from the manufacturers.

Notwithstanding all the care which can be bestowed, it will sometimes happen, that an extract, which is seldom used, becomes mouldy, that a tincture deposits a sediment, or some other preparation imperceptibly loses a portion of its efficacy. The alterations which are occasionally made in the Pharmacopœia, both in the nomenclature and in the strength or composition of the preparations, add to the difficulty, and sometimes give rise to deviations from accuracy which are quite unintentional. In such cases

allowance should be made on one side, and admonition thankfully received on the other.

We make this remark in reference to the following observations by Mr. Richard Phillips, on the strength and purity of the mineral acids, and hope that his suggestions will induce our readers to make the needful examinations for the purpose of ascertaining the correctness of his statements, and of rectifying any inaccuracies which may be found to exist.

ILLUSTRATIONS OF THE PRESENT STATE OF PHARMACY IN ENGLAND.

BY RICHARD PHILLIPS, F.R.S., &c.

Honorary Member of the Pharmaceutical Society.

In the year 1834, several persons conversant with the subject of Pharmacy, were called upon to give evidence upon it before the Medical Education Committee of the House of Commons. Among others, I showed on this occasion, that certain medicines, procured from the most respectable sources, were deficient both in purity and strength; notwithstanding, however, the varied and unquestionable proofs which were adduced of the necessity of some guarantee for the safety of the public, and the reputation of the Physician, nothing whatever was then, or has since been, effected by the government.

The subject was revived in 1838 by the appearance of the Report of the Pharmacopœia Committee of the Royal College of Physicians of Edinburgh, followed by a very able Appendix from the pen of Dr. Christison.

In order to remedy the evils which have been but too justly complained of, Dr. Christison appears to be of opinion that a "system of inspection" of the shops of Chemists and Druggists is requisite, and to insure its success, he observes, that "it seems essential that a committee of inspectors should be appointed for each metropolis of the empire; that the members be nominated by the general body; that they have the power of nominating assistants or deputies in country districts; that they shall receive a salary in proportion to the duty discharged; that they shall be so numerous as to insure the visitation of every shop at least twice a year; that penalties be inflicted for the wilful possession of spurious drugs; and that these penalties be recoverable by a simple legal process *."

* We beg to remind our readers, that at the time Dr. Christison published this proposition, the Chemists had not united for the purpose of placing their body under proper regulations. If we persevere in the course which has now been adopted, any extraneous and inquisitorial interference will be altogether superseded.—Ed.

In page 505 of the Pharmaceutical Journal, I find the following statement, under the head of "*Bill to regulate the Medical Profession:*" "We learn from the Medical Journals, as well as from other sources, that Sir James Graham is preparing a bill to regulate the profession. The details of this measure are not yet made public, but from the information already received, it appears that a new Charter, and increased powers, will be given to the College of Physicians; the College of Surgeons will enjoy enlarged privileges and increased importance; the Society of Apothecaries will continue to grant licences to practise, but will not examine candidates; the Chemists and Druggists, *having undertaken to reform themselves*, will be allowed to proceed unmolested in their laudable undertaking."

It is not my intention, on the present occasion, to enter into any discussion as to whether the reformation, so imperiously demanded by the circumstances of the case, would be more efficiently performed by the legal interference proposed by Dr. Christison, or by the voluntary efforts of the body requiring improvement; my present object is to adduce evidence as to the extent of the existing evils, leaving others to determine the most eligible process for eradicating them.

Having frequent occasion to employ chemical re-agents, I often find temporary supplies of them necessary, and on these occasions I have applied to the retail Chemist. It is always requisite to be satisfied as to the purity of a chemical re-agent, and often so to determine its strength, and in both respects I have been frequently disappointed. These, and other circumstances, determined me to extend my inquiries, and I have accordingly purchased of various Chemists and Druggists, the articles upon which I shall offer some observations, premising that I have usually sent prescriptions for them, directing each medicine to be as ordered in the London Pharmacopœia.

I shall not mention the names of the parties from whom I received the medicines of the quality of which I complain, for I have no personal feeling whatever in the inquiry which I am instituting; it is also proper to add, that I have in general obtained the articles from Chemists, who, on account of the local stations which they occupy, or the extent of their establishments, must be admitted to be among the most respectable members of the class to which they belong; and the results of my examinations will show, that even among these there is great need of improvement.

In my inquiries I have not adopted any particular order of proceeding, I have, however, commenced with those articles whose impurity is readily detected by re-agents, and their strength generally determinable by ascertaining their density.

I shall begin with the Acidum Nitricum; this I procured from

seven different Chemists, and it would be difficult, if not impossible, to select cases more to the purpose.

The process of preparing nitric acid is extremely simple: it consists in submitting equal weights of sulphuric acid and nitrate of potash to distillation; no complicated, nor even any cooling apparatus is required, and in less than three hours I have frequently decomposed a pound of nitrate of potash, by the heat of a common Argand lamp, and obtained ten ounces of nitric acid, of sp. gr. 1.5., as directed in the Pharmacopœia.

I sent a prescription to the several persons from whom I procured the nitric acid, specially directing that it might be that of the London Pharmacopœia. The density of each specimen and its strength were as follows:

	Specific gravity.	Real acid per cent. (nearly).
No. 1	1.357	49.4
" 2	1.367	51.0
" 3	1.370	51.4
" 4	1.399	56.1
" 5	1.401	56.5
" 6	1.412	58.5
" 7	1.459	68.3

Nitric acid, of sp. gr. 1.5 *, as ordered in the Pharmacopœia, and containing 80 per cent. of real acid, was not, therefore, received from any one Chemist, nor from one of several others to whom I applied for it; and it will be observed, that the difference in strength between the weakest and strongest of the above specimens amounts to about 19 per cent.

To determine whether any of the parties who supplied these acids were aware of their deficiency in strength, or rather, if aware, had applied their knowledge in apportioning the acid to the water, in preparing the *Acidum Nitricum dilutum*, I sent a prescription for this also to them, and the specific gravity and per centage of the diluted acids received were as follows:

	Specific gravity.	Real acid per cent. (nearly).
No. 1	1.040	5.97
" 2	1.044	6.77
" 3	1.042	6.37
" 4	1.061	9.16
" 5	1.066	9.56
" 6	1.056	8.36
" 7	1.069	10.00

* Some of the most experienced and extensive manufacturers of mineral acids assert, that nitric acid, of sp. gr. 1.5, is practically objectionable as an article of commerce, being generally a coloured acid, and having a tendency to assume a still deeper colour by keeping. The acid of 1.4, or even 1.45, is less subject to this variation.—Ed.

Now, I find that dilute nitric acid, when properly prepared, has a specific gravity of 1.080, and contains very nearly 12 per cent. of real acid; it is, therefore, evident, that the Chemists in question had omitted to notice, or at any rate to rectify, the error arising from the deficient strength of their stronger acid; and it is further shown, that the volumes of strong acid and water, directed to be mixed, cannot, in some cases, have been employed; No. 3, which is acid of 1.370, gives a weaker dilute acid than No. 2, of 1.367, while that of 1.401 yields a stronger dilute acid than that of 1.412; and, lastly, the strength of the weakest diluted acid, is to that of the strongest diluted, nearly as 6 to 10, and the former is only about half of the strength of that directed in the Pharmacopœia.

In general, although the nitric acid which I procured was deficient in strength, its purity was greater than might have been anticipated; not one specimen contained sulphuric acid; No. 1 and No. 3 contained no hydrochloric acid; Nos. 2, 4, 6, 7, contained a little of it; and No. 5 a considerable quantity.

The great difference of strength existing between the weakest and strongest of these acids, is such as may have occasioned considerable disappointment to the practitioner, and great inconvenience to the patient. If, for example, the prescriber had found that the favourable effects which he anticipated had not been produced, and had in consequence increased the dose, it is needless to attempt a description of what might occur, supposing that the patient had at first been taking acid of 6 per cent., and afterwards, in consequence of changing his Chemist, should have been served with acid of 12 per cent.

This is no imaginary case; and the disagreeable effects it may produce are well illustrated by the following statements: Dr. Paris mentions, that "a very unpleasant circumstance lately occurred from such a cause, in one of our public institutions: arsenic had been obtained from the shop of a respectable Chemist, who had not usually supplied the establishment, for the purpose of preparing the arsenical solution; the article happened to be less adulterated than that which had been previously employed; the solution, however, was prepared in the usual way, and the usual dose was continued, when the patients were soon seized with violent pains in the bowels, and the cause was not detected until by an examination of the bottle the usual sediment was not discovered."—*Pharmacologia*, vol. ii., p. 92. 5th edit.

The other instance is given by Dr. Christison, as happening in his own practice: "A man affected with palsy took every evening gradually-increasing doses of a strychnia less pure than the average, till at length one evening the dose was directed to be increased from two-thirds to three-fourths of a grain in two pills.

At the same time the sample of the medicine supplied by the Apothecary was changed for one of almost snowy whiteness, and consequently far purer. Through some lucky whim, the patient took only one pill. In the night-time he was attacked with violent tetanic convulsions, protracted spasms of the extremities, severe locked-jaw, violent opisthotonos, spasmodic fixing of the chest, and all the other formidable symptoms of poisoning with this alkaloid; in which state he continued for several hours. From all we know of the effects of strychnia, there can be little doubt that had he taken both pills the issue would have been fatal."—*Edin. Med. and Surg. Journal, April* 1838.

Although, as I have already admitted, nitric acid of insufficient strength, might be used in preparing the diluted acid, by increasing the quantity, there are other cases in which it could not be employed, even in increased proportion, without essentially diminishing the strength of the preparation such, for example, is the Spiritus Ætheris Nitrici, in this no quantity whatever of a weaker acid could be substituted for the proper proportion of a strong one, on account of the water which would necessarily be added with it.

Acidum Hydrochloricum is the preparation which I shall next notice. Although common salt is not so readily and rapidly decomposed as nitrate of potash by means of sulphuric acid, little difficulty attends the preparation of hydrochloric acid, I have often procured it by using a common retort and receiver, and an Argand lamp.

I sent for this acid to a Chemist and Druggist without a prescription, merely requesting that it might be such as is directed in the London Pharmacopœia; the following are among the tests given of its purity: colourless; entirely evaporable by heat; when mixed with distilled water, neither chloride of barium nor ammonia throws down anything; specific gravity 1.16.

The Chemist to whom I sent for this acid, had the candour to state that his article was not of the Pharmacopœia quality, and I found, accordingly, that it was not colourless, but of a deep yellow colour; it was not totally vaporized by heat; when diluted it gave a considerable precipitate with chloride of barium, and ammonia threw down a reddish-yellow precipitate; its specific gravity was 1.144. The impurities of this specimen of hydrochloric acid were therefore sulphuric acid and sesquioxide of iron, and it was too weak by about 3 per cent.

It must certainly be admitted that neither of the above-mentioned impurities is of importance in medicine, whatever it may be in chemical investigations; it may also be granted, that its deficient strength may, in most cases, be compensated for by increasing the quantity; how far this was attended to in the present instance, was shown by examining the acidum hydro-

chloricum dilutum, which was sent for and obtained as being prepared according to the Pharmacopœia. This is made by mixing one measure of strong acid with three measures of water, and simple as this operation is, it must, in this case, have been mismanaged, for instead of using more acid to compensate for its weakness, the Chemist must have used less than one measure to three measures of water, for the diluted acid contained only about five-sixths of one measure of the hydrochloric acid, weak as it was.

I procured hydrochloric acid by prescription from another Chemist, it was colourless, contained neither sulphuric acid, sesquioxide of iron, nor chlorine, but its specific gravity was only 1.137, and was consequently weaker than it ought to have been by about five per cent.

The next specimen which I obtained, was of a bright yellow colour, it contained no chlorine, some sesquioxide of iron, and a considerable quantity of sulphuric acid; its specific gravity was 1.156, so that it was very nearly of the required strength.

On procuring a portion of this acid from another source, I was warned of its great strength by the person who sold it, and to prevent much mischief arising from this cause, he diluted it before he served me with it: I suspect however, that this was needless, for what I actually procured, had a specific gravity of only 1.116, and was at least 8 per cent too weak, or contained scarcely 3-4ths of the proper quantity of real acid; it had nevertheless a strong smell of chlorine, dissolved gold, and decolourized indigo, contained much sulphuric acid, some sesquioxide of iron, and was of a light yellow colour.

I did not in these latter cases procure the diluted acid, as I did in the first, not thinking it requisite to do so; I may, however, remark that a patient who had received the colourless hydrochloric acid which I have described, would naturally and justly suspect that some error had been committed if he afterwards obtained it of the yellow colour, possessed by three of the four samples above mentioned.

The Chemist to whom I last applied to have the prescription prepared, in which twenty drops of hydrochloric acid were directed to be taken twice a day, referred to the Pharmacopœia, and, as I believe, to a posological table, he mentioned that the dose was a large one, but having assured him that the necessary precaution would be observed, he omitted to put the number of the "drops" to be taken, and gave me hydrocyanic instead of hydrochloric acid. On this case I do not think it requisite to make any comment, merely observing, that the mistake did not arise from any want of clearness in the writing of the prescription, for four persons had given me hydrochloric acid as directed, though, as already stated, not of the requisite quality.

TRANSACTIONS

OF

THE PHARMACEUTICAL SOCIETY.

Mr. Redwood being unable, in consequence of a severe cold and loss of voice, to deliver the lecture which had been announced for the 28th of September, and which was intended as an Introductory Address to the Students, preparatory to the Winter Courses of Lectures, the Vice-President on that occasion delivered the following

ADDRESS.

It must, I think, be clear to every reflecting mind, that the business of a Chemist and Druggist is one which demands the whole energies of the mind as well as the body, and that to fulfil its duties with advantage to society, the intellect must be cultivated by education and application, not only from the very first introduction to its pursuit, but at every subsequent stage through life; more especially in these days, when every thinking man, be his occupation what it may, must feel how difficult it is, even with a considerable share of attention, to keep pace with the rapid progress of improvement in every department both of art and science.

It is greatly to be regretted, that so many circumstances have combined to keep the great majority of Chemists and Druggists, in past times, to that continuous and unwearied application to the mere mechanical part of their business, which commercial habits induce; so that we have constantly had occasion to deplore the lack of information in the principles of our art, which has been betrayed by many who have been brought up to it. Without entering into the various causes of this deficiency, the most striking has certainly been the want of a defined and regular system of education amongst the Chemists and Druggists as a body, and the absence of some compulsion to avail themselves of it.

Chemistry and Pharmacy, Materia Medica and Botany, are among the subjects taught in our public schools of medicine; and to these the Chemist and Druggist may, if he please, resort: but it is not only optional for him so to do, but it is no disrespect to the able men who teach in those schools, nor any disparagement to the instruction therein conveyed, to say, that it is more adapted, generally speaking, to the pursuits of those who are hereafter to become scientific or medical men, than for those whose lives must necessarily be spent in the humbler, but not less honourable and useful engagements of practical detail.

Many of us, it is true, both in town and country, have availed

ourselves of the opportunities to which I allude, and conscious of the value of such information as is thus to be obtained, and the necessity of acquiring it, in order to the satisfactory and successful fulfilment of our duties, have offered these advantages to the pupils committed to our trust; and I need only advert to the aspect and general state of the Druggists' shops in later times, in contrast with what they once were, even in the recollection of many now living, or for a moment glance at the attainments of many among our own body, to show that we have not altogether neglected those qualifications which, it may fairly be presumed, have obtained for us the confidence which we now enjoy.

The time, however, has arrived when neither the profession nor the public will suffer the systematic education and proper qualification of the Chemist and Druggist to be a matter of voluntary or enterprising choice. Some general test of competency will be insisted on from those who have become such large sharers in the preservation of the public health; and it is, therefore, with a view to the preparation for this important era in our history, and to the most certain accomplishment of this essential point, that one grand object of our Society is the establishment of a "School of Pharmacy," as a means for introducing a regular system of instruction, and wherein shall be taught, in the most appropriate manner, the several branches of knowledge, by which every future Chemist and Druggist may obtain those qualifications, which shall fully entitle him to the confidence now so generally reposed in him.

In furtherance of this paramount object, we have laid down in our Constitution the nature of the education which we consider the Chemist and Druggist should pass through.

We conceive that no youth should be allowed to enter upon the study or practice of Pharmacy, who has not received such a scholastic education as shall have brought his mind into habits, which will prepare him for a pursuit in which the intellect must be brought into exercise continually; and though, in the first instance, we have only insisted on a knowledge of the Latin tongue, we are quite sensible of the advantages to be derived from an acquaintance with Greek and French, and the elements of mathematics, and we hope the day is not so very far distant, when an examination in these will be required.

We then consider that a young man's professional knowledge should embrace a competent acquaintance with Chemistry, Materia Medica, Botany, and Pharmacy, upon each of which subjects I would now offer a few very plain and practical, though very superficial remarks, remembering how admirably they have been brought before us in the several Introductory Lectures, which have already been delivered previous to the opening of the

School, and the perusal of which I earnestly recommend to those who had not the privilege of hearing them.

Chemistry, as immediately connected with our occupation, is that science which acquaints us with the elementary constitution of the substances used in medicine, and the nature of the combinations which they undergo for that purpose. It is manifest therefore, that a knowledge of its principles lies at the very foundation of a Pharmaceutical education; it may indeed appear unnecessary to insist on so self-evident a truth, but many of us must acknowledge that we have neglected to profit by it as we ought, and have often had reason to regret our deficiency in this branch of science. Many too there are, even at this period, who are not sufficiently impressed with the necessity of cultivating an acquaintance with Chemistry. Were not this the case, we should not so frequently have to deplore the lamentable ignorance of many young men who come to London for employment, and who scarcely seem to have considered the business in which they are engaged, as anything more than a mere mechanical or at most a commercial art. Such indeed it must continue to be in the hands of those, who are too idle or inconsiderate to make use of their minds; but in these days when men of industry and application are continually making improvements in Pharmaceutical operations, and extending Chemical discoveries, such ignorance will not only subject the individual who is guilty of it to well-merited disgrace, but public opinion will no longer tolerate its continuance.

Without some knowledge of Chemistry a man is working in the dark, he can know nothing correctly of the results of, or the reasons for the operations he constantly performs—he can never properly judge of the accuracy and quality of his preparations, he can neither detect any error that may occur nor rectify any untoward circumstance that may arise—he has no established data to reason upon—no fixed principles to guide him; but is, like a mariner without a compass, exposed to endless confusion and mishap. When we consider the vast additions made to the Materia Medica, and the improvements that have arisen in Pharmacy from chemical research, especially in the more recent operations of organic analysis—when we look at the aspect of modern Pharmacopœias (the last, for instance, published by the London College, and its authorized Translation, with Mr. Phillips' notes), and the introduction of chemical nomenclature, founded on the atomic theory, it is evident, that no man can enter into business as a Chemist and Druggist with the least credit to himself, or with a reasonable prospect of success, unless he is in some degree acquainted with Chemistry. He will find himself at a loss every step he takes, and not only will he be brought oftentimes into a humiliating position in his intercourse with medical men, but he

will be exposed to the charge of ignorance and incompetency in his dealings with the public; for such is the fashion of cultivating an acquaintance with Chemistry as well as other branches of philosophy, that it forms a part of juvenile amusement and instruction, and is a source of entertainment and improvement in our Scientific and Polytechnic Institutions.

If the agriculturist and manufacturer have brought chemical knowledge to bear upon their respective engagements with such wonderful success, so that it has become almost essential for them to pay attention to its principles, is it too much to insist, that those who are in the daily habit of handling materials which involve the health and lives of the community, should make themselves acquainted with a science which explains the constitution and combinations of the remedies employed?

With reference, moreover, to the important subjects of Medical Jurisprudence and Toxicology, it seems sufficient merely to advert to them, to suggest immediately to the mind the most cogent reasons for cultivating to some extent a science, without which we must be incompetent to afford assistance in cases of emergency, or to detect accident or crime where the life of a fellow-creature has been sacrificed, or is at stake.

Our second branch of education is *Materia Medica:* a subject upon which it appears almost superfluous to say much in the way of recommendation, so completely is it identified with our daily occupation; but, even here, it is to be feared, that many of us have been content with a very superficial knowledge of the materials employed in medicine. Some of us indeed have been favoured with opportunities of becoming acquainted with the sensible properties of drugs, having seen the state in which they originally come into the market, as well as the condition in which they are usually sold; but the facility of procuring most articles in a state fit for use, has tended to deprive many of similar advantages. It will be our aim to rectify this as far as practicable, and to afford to all our pupils the opportunity of seeing the productions of different climates, in their original state, and the alterations they undergo in their collection and appearance in the market, as well as those preparations in the Materia Medica which are manufactured on the large scale. The Museum, which we are now forming, will, we have no doubt, fully enable us to do this—already it gives promise of presenting a collection, where the student may examine specimens of drugs and chemicals of every kind and quality, some of them very curious and rare, some of them in the state in which they ought ordinarily to be found in the shops, and some of such a deteriorated character, as by contrast with the good, may guide the judgment in distinguishing what ought to be selected and what rejected and destroyed.

The study of Materia Medica received in the more immediate and circumscribed acceptation of the term, acquaints us with the history, physical properties, composition, and use of the various articles employed in medicine — the different classifications into which they have been divided by different writers, according to their qualities and effects, and the doses in which they are administered. It enables us to judge of the value and quality of articles in their original state, as Chemistry more particularly does, in their prepared or artificial state; it qualifies us to detect adulteration and imposition, and, in short, is so palpably essential, that no man can be considered a properly educated Chemist and Druggist, who is not sufficiently versed in it to be able to give a satisfactory account of the articles in which he deals.

Nearly allied to Materia Medica, or rather included in it, is the science of *Botany*. In the earlier periods of medical history the study of Botany must have formed a most important feature in medical education, when remedies for disease were so abundantly supplied from the vegetable kingdom; but the introduction of the more active remedies brought into use from the mineral kingdom by Chemistry, tended to allow the study of Botany to fall into desuetude. For some time past, however, attention has again been directed to vegetable preparations, and especially by their analysis into proximate and ultimate principles; and it has, therefore, become essential that the Chemist and Druggist should pay attention to medical botany.

In treating thus cursorily on our educational plan, I wish to point out chiefly that which is of practical utility to the Chemist and Druggist, and as I have purposely abstained from going into those collateral subjects, which really belong to the Materia Medica, so in speaking of Botany, as well as Chemistry, while I would throw no obstacle in the way of the highest attainments in all these sciences, but rather encourage our young men to aspire to them, I am only desirous of insisting upon such a measure of information in them, as is requisite for the safe and efficient performance of their duties. With respect to Botany, it is undoubtedly desirable that we should understand the structure, growth, and functions, and also the sexual and natural classifications of plants, both of home and foreign production, but it is in the use of indigenous vegetables that a knowledge of Botany becomes essential. The Chemist and Druggist ought to know well the external character of the roots, foliage, flowers, fruits, and seeds of the various plants employed in medicine, both in their recent and dried state, so as readily to distinguish them; the proper season for using them in the one, and the best mode of preserving them in the other condition; also the effect of cultivation, soil, and season upon them—points upon which so much depends the efficacy of

their use, whether in their natural state or in their various preparations: this general knowledge of Botany cannot be dispensed with.

Our last subject of education is PHARMACY, that branch of the medical art which is peculiarly the province of the Chemist and Druggist. It may be considered both as a science and an art; the first, according to Dr. Duncan, involving an acquaintance with the physical and chemical properties of the substances employed in medicine; the latter the various preparations which those substances undergo. Having already in the preceding observations touched on the scientific part of Pharmacy, I would make a few remarks upon the art, as it is practised by ourselves.

The business, then, of a Chemist and Druggist, as a pharmaceutist, is to prepare for administration to the sick, those remedies which the physician uses and prescribes, whether in the bulk or as dispensed in prescriptions. He is to bring to bear upon the articles furnished to him by the Materia Medica, the principles of chemical and botanical science; and then in the most efficient, convenient, and elegant form, to prepare the various compositions ordered in the Pharmacopœia, or prescribed extemporaneously by medical men. To do this as it ought really to be done, he must be an educated and industrious man; educated for his peculiar avocation, by having his mind stored with, and his hands accustomed to make use of, the information that has already been adverted to.

Nothing has tended more to the elevation of our body to the station which it holds in professional and public estimation, than the attention we have bestowed upon the art of Pharmacy. Whether we consider the improvement made in the preparation of medicines on the large scale, or the care and aptitude of manipulation introduced in dispensing medicines, it is quite evident, that practical Pharmacy has made great advances by the labours of the Chemist and Druggist; and while I am quite willing to yield the palm of scientific attainment to the Pharmacien of foreign climes, I feel quite justified in claiming for my own countrymen, so far as I have been able to ascertain from a variety of travellers both in and out of the profession, the merit of possessing a more complete assortment and arrangement of medicines for practical purposes, and a greater readiness and aptitude of manipulation in supplying them; and I feel confident that in the great matter of health, as well as every other convenience or luxury of life, no nation upon earth possesses such ample means for its preservation, or greater facilities for procuring, in the best condition, the remedies necessary for its restoration.

It is with a view to extend these advantages universally, and to enlarge the means for the acquisition of knowledge in this our peculiar department, so that all who are engaged in it may become qualified persons, that we have paid especial regard to this branch

of instruction. We hope to establish such a system as will open up the prospect of obtaining a thorough pharmaceutical education, fully adequate to the claims which the public have upon us, and which shall leave without excuse the man, who neglects to avail himself of the opportunity afforded for acquiring every needful information connected with his daily pursuits; and in so doing we feel conscious that we shall open the door to a field which has not hitherto been so exclusively explored as its importance demands. I would only bespeak your attention to the Syllabus of our course of Lectures on Practical Pharmacy, that you may see the peculiar nature of the instruction which we contemplate on this head.

These then, are the subjects which form the education upon the possession of which we ground the qualifications of the Chemist and Druggist. I make no apology for having touched so slightly on them, as otherwise I should have been trenching upon ground which belongs to those who are to stand here as Teachers of our Classes, and it would ill become me to expatiate upon them in the presence of many, at whose feet I should be thankful to sit and learn. I am quite conscious that the remarks which have been made contain nothing that is new, and while they will meet with a response in the minds of those I have the honour to address, I am sure I should not fulfil my duty on this occasion, if I was to refrain from urging as I now do, upon our brethren in the distant parts of the country, and especially upon all our younger Members and Associates, whether in business for themselves, or yet in a state of pupilage or as Assistants, the absolute necessity and propriety of applying their minds most decidedly and actively to the subjects upon which I have spoken.

In these remarkable times, when education is everywhere spreading, when Literary and Mechanics' Institutes are flourishing, when Associations for the advancement of science are in active operation, when Medical and Surgical Schools are multiplying on every side, shall the Chemist and Druggist, who is entrusted with so large a share in the preservation of the public health, be behind-hand in a strenuous effort to obtain a thorough acquaintance with an Art and Science, which connects him with a noble profession, and which demands and is worthy of, the full and energetic application of the human mind? Is he to remain day after day and year after year chained without interruption to the mere routine of a shop counter, with no other object in view than to obtain a livelihood or to amass wealth? We have never from the first advocated such an entire application to scientific pursuits, as should unfit our young men for those habits of business, which are equally essential to our usefulness, comfort, and success, but we are most anxious to induce all to aspire to such an acquaintance with the science of Pharmacy, as

can alone fit them to practise it efficiently as an art. In this we must confess, that we are *nationally* behind our Continental and American brethren. They have for a long time considered Pharmacy worthy of a distinguished place in their schemes for Medical Education, and it is not too much to say that it is to those *public* facilities for acquiring and advancing Pharmaceutical knowledge, that we are indebted for the splendid discoveries and improvements made by foreign Pharmaceutists; not, however, that I would by any means forget or obscure the honour due to our own highly-favoured country, in having produced those eminent individuals both dead and living, to whom Pharmacy owes so much. There have always been, and ever will be many, whose thirst for knowledge and whose ardour in the pursuit of it, will surmount every obstacle and rise above every disadvantage; such men are far above my praise, but while I gladly and thankfully hold them up to public admiration and imitation, I wish to show, that we are anxious to lay the foundation of a *national establishment*, which shall make it imperative upon every Chemist and Druggist in the kingdom, to qualify himself properly for his responsible work.

In contemplating the scheme which it has been my object in some measure to unfold, there are many, I am aware, who will take very opposite views: to the purely scientific eye it will appear contracted—to the mere man of business it will seem too much enlarged. This is not the time to say much upon either point; but I venture to crave, for those who have been occupied in the plan, credit for taking the most comprehensive view of the subject, and of adapting it, at the same time, to our present condition. We are not about to merge the trade in the profession; but to establish the trade upon fixed and scientific principles, and, while our examinations will be lenient and our instructions somewhat elementary and concise, in the first instance, we shall not stop there, but by a judicious and gradually-increasing stringency in the one, and a more enlarged and complete scheme for the other, as we are able to bear it, we hope to accomplish all the improvements which have been originally contemplated.

The syllabus of our lectures is now on the table, and we think ourselves happy in having obtained the services of gentlemen whose kind and uniform interest in our institution, has afforded us opportunities of knowing how well they understand the nature of the instruction we are anxious to impart to our pupils, and the mode of adapting it to our wants. These lectures are open to all upon very reasonable terms, and have been fixed for delivery at such hours as, upon the maturest consideration, were found least likely to interfere with other avocations.

Our Library and Museum are open during the office hours, and for the convenience of our Associates, in the evening from eight till

ten ; and here let me remind our young friends of the advantages to be derived from reading and observation. Great as are the benefits resulting from oral instruction, it is no substitute, believe me- for private reading and meditation and a practical acquaintance with the articles of the Materia Medica. Accustom yourselves to examine closely the drugs and chemicals which are continually passing through your hands, as well as avail yourselves of our public collection ; and while I recommend you to come here, and read at your leisure hours, let me, in the most pointed manner, advise you to study at home the Translation of your London Pharmacopœia. It is the great statute-book of our profession, and it is the text-book of our examination, and, whatever may be said of its imperfections, we may be quite sure that the learned body who compiled it, are quite as sensible of them, if there are any, as those who are so very anxious to point them out, and that it is their earnest aim to make it fully subservient to the ends for which it is published and put forth. At all events, it is your duty to become thoroughly acquainted with its contents, and not merely to open it as immediate occasion may require ; and, while I would just direct attention to the notes which have been introduced in the former part of the text, and to the explanatory notes of the translator, I may close these remarks by adding, that he will be no mean Pharmaceutist who has the Pharmacopœia in his head and at his fingers' ends.

To those, then, who undertake the care and education of young men for Chemists and Druggists, I would express an earnest hope, that they will, by private endeavours, and by allowing them the use of those means which we furnish, as circumstances may admit, assist and stimulate their pupils in the acquisition of all necessary and useful information. I think our Members in London amount to about 400, and our Associates to 600 (besides 1200 Members and about 1800 Associates in the Country) so that we have a right to calculate upon a large class. Much encouragement has been afforded us by the numbers that attended the course of Botanic Lectures already delivered during the summer, and much satisfaction was expressed by Dr. Thomson at the punctuality, attention, and proficiency of the pupils ; we look however for a larger accession of numbers to the present course, and for an equally gratifying testimony at its close.

To young men I would say, that with all the advantages upon which I have been dwelling, much, very much, depends upon themselves. Knowledge and proficiency can never be acquired without industry and application, and a wise and economical use of time. Our daily avocations, I am quite aware, involve a considerable absorption of this ; still if the mind is alive, and there is a determination to improve, there will never be wanting opportunities which, if made a good use of, will infallibly lead to the

most successful results. Early rising, temperate habits, orderly conduct, and diligent attention to duty will create leisure, and induce an appetite for study and observation, and at the same time obtain indulgence and consideration in the allowance of opportunities for the pursuit of it. It is to you the public will be looking for the beneficial effects of our Institution, inasmuch as you are the chief recipients of its advantages; and it will be no slight reward to those who have laid the foundation of the PHARMACEUTICAL SOCIETY to know, that they will be succeeded by a race of men who will excel them in every qualification which constitutes the character of an accomplished Chemist and Druggist.

The VICE-PRESIDENT having concluded his address, observed that the observations which he had thought it right to make, having been arranged on short notice, and being confined to topics of a general nature, Mr. FOWNES would occupy the remainder of the evening with a few illustrations of Chemical Science, which would be interesting to the meeting; on which Mr. Fownes introduced a specimen of

HYDROCYANIC ACID, WHICH HAD UNDERGONE DECOMPOSITION,

and which was converted into a black solid substance. A portion of this acid had been prepared above two years ago, and the remainder had been subsequently added to it. It was so highly concentrated, that whenever the stopper of the bottle was removed, some of the vapour escaped with some force. Until lately it had remained apparently unaltered; but, on subsequent examination, it was discovered in its present state. Mr. Fownes observed, that the cause of this peculiar decomposition was not satisfactorily explained. It had been suggested, that it might be prevented by the addition of a minute quantity of sulphuric or any other mineral acid, but the manner in which these substances acted in preventing decomposition was not understood. The black substance resulting from the change, is supposed to consist of carbon and nitrogen. Ammonia is also present, and other bodies.

Mr. Fownes also exhibited some specimens of uric, hippuric, and benzoic acids. The benzoic acid had been prepared from the urine of cattle, a source from whence it could be obtained in unlimited quantity, by a very simple process; for this purpose the urine might be collected and allowed to stand for some days in a tank or reservoir, until decomposition had taken place, after which it should be evaporated to the consistence of thin syrup, and on the addition of hydrochloric acid a copious deposit of benzoic acid in crystals would be obtained. Benzoic acid procured in this manner does not possess the smell usually found in the benzoic acid of the shops, which results from its contamination with an essential oil, one of the constituents of gum benzoin. The acid, when free from this oil, possesses no odour.

PHARMACEUTICAL MEETING,

OCTOBER 12th, 1842.

MR. PAYNE, VICE-PRESIDENT, IN THE CHAIR.

The Chairman congratulated the Members of the Society on the circumstance, that several communications had been received from foreign countries, among which was a very interesting and valuable paper on the administration of musk, by Dr. Bourgan, of Demarara; but the subject was treated in a manner so completely *medical*, that it was considered by the Committee to be scarcely calculated for discussion at a *pharmaceutical* meeting. The first paper which would be read was

ON A FALSE JALAP HAVING A ROSE ODOUR.

BY M. G. GUIBOURT,

Professor of Natural History to the School of Pharmacy at Paris.

(COMMUNICATED BY DR. PEREIRA.)

M. Brazil, one of our most distinguished druggists, sent me, a short time since, a root which he found in some bales of jalap coming from Mexico, and which so closely resembles true jalap in its external appearance, that it requires an attentive examination to distinguish it. This resemblance is such, that we cannot doubt that the new root is derived from a *Convolvolus* allied to that which furnishes jalap, and, nevertheless, it differs so much in its composition and medicinal properties, that it is very essential to know how to distinguish and separate it.

True jalap is generally in pear-shaped or turnip-shaped tubers, from which frequently issue laterally smaller tubercles, curved in the form of a horn. It is of a blackish grey colour externally, heavy, compact, with a brownish fracture, a strong nauseous and very characteristic odour, and an acrid, pungent taste. The surface, independently of the incisions, which are made in it in order to facilitate the desiccation of the interior, is often smooth, or only marked with slight furrows. When it is cut transversely, the section, after having been polished, is very compact, and has the appearance of a very deep coloured wood, with concentric circles still darker: the odour of the section is strong and irritating.

Such is the best officinal jalap, but it not unfrequently happens, and it is this which makes the distinction difficult, that the officinal jalap, having been originally more watery, more amylaceous, and less resinous, instead of being hard, compact, and of the colour of dark wood in the interior, and presenting an irregular surface, is, on the contrary, light, whitish, and deeply furrowed in process of drying. This jalap presents a

greater resemblance to the new root; but it may, however, always be distinguished from it by the characteristic odour, and more or less acrid flavour of the true jalap.

The new root described by M. Brazil, is in ovoid tubercles, lengthened and tapering at both extremities. The surface is always very deeply furrowed, blackish at the bottom of the furrows, but almost white on the prominent parts which have been exposed to the friction of the pieces against each other. The interior is almost white, and the transverse section when made with a saw is not susceptible of a polish; it is porous, whitish, especially in the centre, with concentric circles of a brown colour. The part near the circumference is the only one which sometimes presents the brown colour of officinal jalap. Lastly, this root, in mass or in powder, exhales a strong odour of roses. I think this odour is not accidental, because the samples of root which I have examined were taken from the middle of bales of true jalap, the odour of which is quite different, and it is not until some time after their separation, when the smell communicated by the true jalap is dissipated, that the other aroma becomes distinctly perceptible. The odour, however, is weak, and must eventually subside; at the same time I believe from its nature, it does not exist in the fresh root, but is developed in the process of desiccation, as is the case with Valerian and some other roots. The taste is sweet, rather like sugar, and not at all acrid.

This new root possesses peculiarities which make it a link or intermediate species among three others which belong to the same genus *Convolvulus*, which hitherto appeared to have nothing in common. I shall first speak of the true *Jalap*, a powerfully purgative root, analogous to Scammony, Turpeth, and the roots of some of our indigenous Bindweeds; secondly, of the *Rhodium wood of the Canaries*, a woody root of *Convolvulus scoparius*, impregnated with a volatile oil, analogous to that of roses; thirdly, of the *Batatas*, the root of *Convolvulus Batatas*, which is purely amylaceous and saccharine. Now, here is a new root, amylaceous and saccharine, like the Batatas, a little resinous like jalap, and having an odour of rose like the Rhodium wood. This is then a link between the three substances, which, as I have before observed, appeared unconnected.

To determine with accuracy the medicinal value.—1. We shall see presently that there exists between *Jalap* and the *Batatas*, a relation which had not been suspected; it consists in the presence of a considerable quantity of sugar in the first of these two roots. I have made an analysis of the new root, in which I have confined myself to the determination of the proportions of the principal ingredients.

Sixty-five grammes [1003.21 grs. troy] of the new root pulverized were treated with ether. Thinking at first that I was acting upon a simple variety of jalap, and the resin of jalap being almost insoluble in ether, my motive for this proceeding was to dissolve at first the oily aromatic principle: but, from the first moment, the high colour which the ether assumed, convinced me that the resinous principle was easily soluble in it, and that it, therefore, differed essentially from the resin of jalap.

The ether having been distilled, left 2.2 grammes [33.9548 grs. troy] of inodorous residue, the distilled product having acquired the rose odour of the root. I might probably have obtained the aromatic oil by evaporating the ether in the air, but I should have lost above 500 grammes of ether.

The product obtained by the ether was boiled in water, and was reduced to 1.2 grammes [18.528 grs. troy] of insoluble matter. The aqueous solution was added to the following product.

The root exhausted by ether was treated with rectified alcohol. It was distilled to three-fourths, and the residue mixed with the aqueous liquid above mentioned, and an additional quantity of pure water. It was boiled and allowed to cool and settle. There remained only 0.9 [13.8906 grs. troy] of insoluble resin, which added to the 1.2 of resin obtained by the ether, amounting to 2.1 [32.4114 grs. troy] the quantity of this principle contained in 65 grammes of root.

The aqueous, liquid filtered and evaporated as much as possible by a water-bath, left 10.7 [165.1438 grs. troy] of an orange brown syrup of a very saccharine flavour.

The marc of the false jalap was treated with cold water, which formed a magma, very bulky and thick, but rather granular than mucilaginous. The liquors evaporated to the consistence of syrup were diluted with alcohol to precipitate the gum, which, when dried, weighed 2.52 [388.9368 grs. troy]. The alcoholic liquid distilled, produced 3.85 [59.4209 grs. troy] of an extract somewhat saccharine, but also bitter and astringent.

The bulky residuum of the false jalap assumed a blue colour on the addition of iodine. Having often been convinced that decoction in water is ineffectual in separating the starch from the woody matter, I prepared a solution of caustic potash of such a strength that, on adding it to starch in plain water, this body was completely dissolved. I added this solution to the residuum of the false jalap, allowed it to macerate for twenty-four hours, and boiled it once in water. The residuum was still very bulky, like jelly, and resembling rather a gummy insoluble body, than true woody matter. The addition of iodine still produced a blue colour. It weighed, when dry, 29.9 grammes [461.4766 grs. troy].

The alkaline solution of starch was neutralized by acetic acid, evaporated to a demi-gelatinous consistence, and precipitated by alcohol. The starch, well washed and dried, weighed 14.75 [227.6515 grs. troy].

The following are the results of this analysis :

Resin	2.10	—	3.23
Liquid Sugar	10.70	—	16.47
Saccharine extract	3.85	—	5.92
Gum	2.52	—	3.88
Starch	14.75	—	22.69
Amylaceous woody matter	29.90	—	46.00
Loss	1.18	—	1.81
	65.00		100.00

When I wished to compare this composition with that of jalap, I found myself very much embarrassed. All the analyses of the latter which have been published, are so evidently incorrect and discordant, that it was necessary to perform another, not complete, and comprising all the salts and principles of every kind which may be found in the root, but sufficient to indicate the proportions of purgative resin, gum, starch, extract, and woody matter. In order to show the necessity of making this analysis, it is only needful to state, that while M. Henry, sen., attributes to sound jalap 42 parts of woody matter and 20 parts of starch, and Cadet 29 of woody matter and only 2.9 of starch, the analysis of Gerber indicates 6 of starch, without any woody matter. The quantity of resin is generally fixed at ten or twelve per cent.

I took 100 grammes of officinal jalap in powder, which I treated with rectified spirit (sp. gr. 0.852). The spirit having been distilled, I added water to the residuum, boiled it for some time, allowed it to cool, and filtered. The dried resin weighed 17.65; the aqueous liquor evaporated produced 19 grammes of a brown deliquescent extract, of a saccharine flavour, rather astringent, and not acrid.

This extract, re-dissolved in water, neither precipitates gelatine, nor acetate of lead, but precipitates copiously nitrate of silver, oxalate of ammonia, and sub-phosphate of ammonia. We must, therefore, consider it as a liquid sugar or *molasses*, deprived of the true extractive principle, but charged with the deliquescent salts of the root.

This extract, re-dissolved in water and treated with animal charcoal, was only partially deprived of colour. Evaporated then, to the consistence of thick syrup, and exposed to the air for several days, it had a granular appearance, indicating the commencement of crystallization ; but the doughy mass having been enclosed in several folds of filtering paper, and submitted

to gradual pressure, was entirely absorbed by the paper, without leaving any crystallized sugar.

The jalap exhausted by spirit was treated with water, and formed a very brown, rather mucilaginous, liquor, which was filtered, evaporated to a syrupy consistence, and diluted with rectified alcohol. The gum precipitated and dried, weighed 10.12. The alcoholic liquid, distilled, furnished 9.05 of a brown extract, still saccharine, so that the officinal jalap which I had thought to differ from the Batatas, and from the jalap with the rose odour, by the absence of sugar, contained at least as much as these two roots.

Gerber is the only person who enumerates sugar among the proximate principles of jalap, and he only admits that it contains 1.9 per cent. of crystallizable sugar. The quantity is much larger, and I think that its uncrystallizable quality is due to the mixture with the deliquescent salts, or to its change into the state of *molasses*, of which it possesses all the physical characters, and that the sugar of jalap ought to be classed with cane sugar. I rely, in the first place, on the fact that most of the uncrystallizable sugar which has been at first admitted as such in vegetables, has been recognised as being cane sugar, when experiments have been made on a sufficient quantity to separate from it the bodies which impede crystallization. I am also supported by the circumstance that the sugar contained in all the parts of phanerogamic vegetables, root, stem, or fruit, has been recognised as cane sugar, whenever the organ of this plant did not at the same time contain an acid which had the property of converting cane sugar into grape sugar. Thus the sugar of grape, of beet-root, of carrot, and parsnip, is cane sugar. The sugar of the sugar cane, Indian corn, sorgho, and maple, is so likewise, as well as that of chestnuts and juniper berries.

The jalap exhausted by cold water, examined by the microscope, appears to be formed of thick and yellow ligneous lamellæ, with other lamellæ thinner and colourless, also of entire granules of starch, generally elliptical and bulky, with other broken granules and folded teguments. This residuum having been diluted with 600 grammes of water to which 20 grammes of pure potash had been added, the granules of starch became much swelled, but were not completely dissolved. They were dissolved by the further addition of ten grammes of potash, and the woody matter alone remained. I then added 400 grammes of water, and after twenty-four hours I poured the whole on fine linen. The woody residuum washed several times and dried, weighed 21.6. The alkaline liquor was neutralized by acetic acid, evaporated to the consistence of syrup, and diluted with

alcohol. The starch which was precipitated was washed with alcohol and dried. It weighed 18.78.

The following are the results of these two analyses:

	Officinal Jalap.		False Jalap (rose odour)
Resin	17.65	—	3.23
Molasses obtained by alcohol	19.00	—	16.47
Brown saccharine extract obtained by water	9.05	—	5.92
Gum	10.12	—	3.88
Starch	18.78	—	22.69
Woody matter	21.60	—	46.00
Loss	3.80	—	1.81
	100.00		100.00

I repeat that these analyses have been made solely to establish the difference in the composition of these two roots, and to point out more clearly the necessity of separating them; and, that if they are sufficient, on the other hand, to show the inaccuracy of those which have been published, they may serve to assist some young Pharmacien anxious to distinguish himself in the useful task of prosecuting more exact researches.

It remains for me to show, that not only does the new jalap differ from the true species in the small quantity of resin which it contains, but also that this root possesses scarcely any purgative effects, which constitutes an additional distinction.

I have sent to M. Rayer the small quantity of resin obtained from sixty-five grammes of the aromatic light jalap, the effect of which he undertook to ascertain in his practice at the Hospital of La Charité. The following is his report:

1. Thirty centigrammes of the resin of rose jalap were given to a woman who is often from five to eight days without an evacuation. She had on this occasion been five days without one. She took the resin at eleven in the morning. Three hours afterwards she had a liquid motion, with griping.

2. Thirty centigrammes of the same resin were given to a young woman of twenty-four years, who had been confined in her bowels for two days. It produced no effect. After twenty-one hours she took thirty centigrammes of the ordinary resin of jalap, which produced six motions in a few hours.

3. Thirty centigrammes of the same aromatic jalap were given to a woman aged fifty-three, who is frequently constipated for three days. She had been so for two days when she took the resin, and at the end of twenty-four hours she had an ordinary evacuation, which was at the usual period.

4. Sixty centigrammes were given to a man aged sixty, who was suffering from jaundice. It produced no perceptible effect.

These cases, though not numerous, are sufficient to prove that this resin differs essentially from the resin of true jalap, and, consequently, that the two roots are derived from plants of different species. I have not found any mention of the jalap with the odour of rose elsewhere, and am not aware what species of *Convolvolus* produces it.

Paris, Oct. 1842.

ON THE CHARACTERS WHICH RESPECTIVELY DISTINGUISH THE FRUITS OF

HEMLOCK, ANISE, AND FOOL'S PARSLEY,

WITH A NOTICE OF A CASE OF POISONING BY HEMLOCK FRUIT TAKEN IN MISTAKE FOR ANISE FRUIT.

BY JONATHAN PEREIRA, M.D., F.R.S. AND L.S., &c.

Assistant Physician to the London Hospital, Examiner in Materia Medica and Pharmacy to the University of London, and Honorary Member of the Pharmaceutical Society.

The resemblance between the fruits (usually called seeds) of anise (*Pimpinella Anisum*) and hemlock (*Conium maculatum*) is such that the one may be readily mistaken for the other by a superficial observer. A case of poisoning, which has recently occurred in France* from an error of this kind, induces me to hope that the following account of the distinctive characters of the two fruits may not be uninteresting to the Members of the Pharmaceutical Society.

The following is a brief sketch of the case referred to:

A gentleman who had at various times derived benefit from the use of an infusion of anise (prepared with eight grammes or about 123½ troy grains of the fruits and 500 grammes of water) took, on one occasion, his usual medicine without deriving therefrom the accustomed relief. On the contrary, he experienced after its use various alarming symptoms, such as extreme uneasiness, followed by slowness of pulse, coldness of extremities and other complaints, all of which ceased after copious vomiting. The physician, who had been called in, having declared that the symptoms resembled those of poisoning, the remains of all the substances used that day at table were examined, but without any noxious ingredient being detected. A fresh infusion of anise was prepared and taken; and the same symptoms, but in a more aggravated form, followed its employment. The water, the sugar, and the anise were now carefully examined. In the two first nothing injurious was found, but in the anise some suspicious fruits were detected, which Professor Richard declared to be

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* *Journal de Chimie Médicale*, for August, 1842.

those of hemlock. They were recognised by the five crenulated ridges which each mericarp or half-fruit presented.

In another place * I have adduced the resemblance between the fruits of hemlock and anise as an argument in favour of the identity of our hemlock with the celebrated Athenian state poison, by which Socrates and Phocion were destroyed, and which was called by the Greeks, κώνειον,† by the Romans, *cicuta*. For Dioscorides declares, that the fruit of κώνειον resembles that of anise, but is somewhat paler.

As many persons, unacquainted with botany, are apt to confound fool's parsley (*Æthusa Cynapium*) with hemlock, I shall describe the essential and distinctive characters of the fruit of this plant as well as of hemlock and anise.‡

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* *Elements of Materia Medica and Therapeutics*, vol. ii., p. 1476. 2d edit. 1842.

† According to Dr. Sibthorp (*Prodromus Floræ Græcæ*, vol. i., p. 187), *Conium maculatum* is called by the modern Greeks, Βρομοχορτον. But the Greek Pharmacopœia (published at Athens, in 1837), a much higher authority on these matters, I presume, than Dr. Sibthorp, gives, "Κωνείου Πόα" as the vernacular name for "*Conii maculati Herba.*" It also gives "Πὰν ὀτοῦ," altered at p. 538 to "Γιαμπὰν πμαλδιρὰν, as the name by which the Turks designate it; but, most remarkably, the word Βρομοχορτον, mentioned by Sibthorp, does not occur among the synonymes.

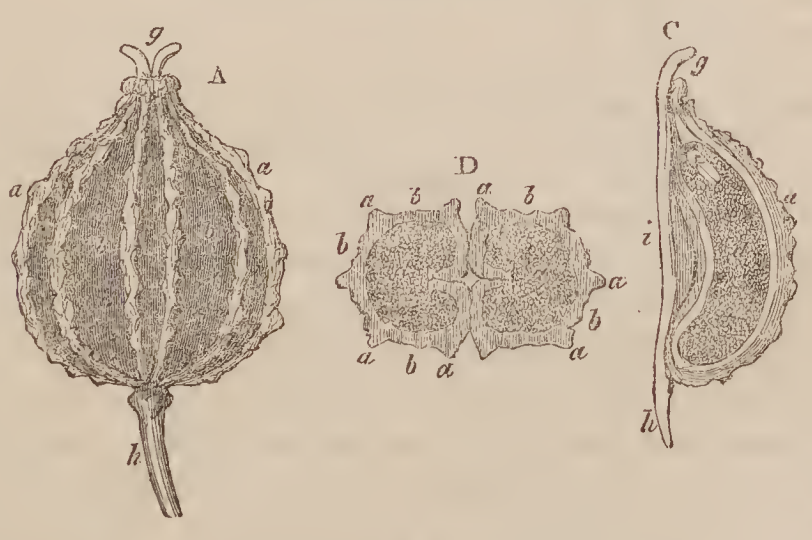
‡ As some of the readers of the PHARMACEUTICAL TRANSACTIONS may not be familiar with the botanical names of the different parts of the fruit of umbelliferous plants, I have thought it advisable to subjoin the following explanatory note:

Botanists call the fruit of umbelliferæ a *cremocarp* (*cremocarpium*, from κρεμάω, *I suspend*, and καρπὸς, *fruit*). Each half of the fruit is termed a *mericarp* (*mericarpium*, from μερὶς, *a part*, and καρπὸς, *fruit*). In trade, however, umbelliferous fruits are usually, but of course erroneously, denominated *seeds*. Thus, the so-called seeds of coriander, fennel, anise, dill, caraway, hemlock, cumin, and carrot are, in fact, fruits, either whole (*cremocarps*), or divided (*mericarps*). The face or side, by which the two mericarps are opposed to each other, is termed by botanists the *commissure*; and the axis or stalk, to which they adhere by their commissure, is called the *carpophorus* (from καρπὸς, *fruit*, and φορέω, *I bear*). Each mericarp has five *ridges* (*costæ* vel *juga primaria*), and, in some fruits, four additional intermediate or secondary ones. In the *channels* (*valleculæ*) between the ridges, and within the substance of the fruit-coats, or *pericarp* (*pericarpium*, from περὶ, *round about*, and καρπὸς, *fruit*), are, in some umbelliferous fruits, one or more linear-shaped receptacles of volatile oil, called *vittæ* (literally signifying fillets, ribands, or head-bands), which are usually of a reddish colour, in consequence of their oleo-resinous contents. Thus the oils of anise, caraway, dill, fennel, &c., reside in the vittæ of their respective fruits, from which they are obtained by distillation. In some umbelliferous fruits there is only one vitta in each channel: these are said to be *univittate*. In others, however, there are several, and these are called *multivittate*. Each mericarp contains one *seed*, composed of *albumen*, and a minute *embryo*. The latter is pendulous from the apex of the carpophorus, and consists of the *radicle* (which points to the *hilum* or *eye* of the seed) and two oblong *cotyledons*.

1. *Hemlock fruits.*—The so-called *hemlock seeds* of the shops consist principally of half fruits (*mericarps*) with some few entire fruits (*cremocarps*), rarely with a portion of the stalk attached. The entire fruits, when dry, readily separate into halves. Anise fruits (called *aniseed*), however, consist almost wholly of entire fruits (*cremocarps*), with a portion of the fruit stalk attached. The entire fruits (*cremocarps*) of hemlock, are roundish, ovate, compressed at the sides, about one line in length, and seldom exceeding one line in breadth. The half fruits (*mericarps*) are arched on the outer side. Each has five prominent equal ridges, the lateral ones being marginal. All the ridges present a notched appearance, or, in the words of De Candolle, they are undulate-crenulate; that is, they are wavy, and have small convex teeth. Examined by the microscope, the elevations or teeth have a tuberculous appearance, sometimes being placed on the edge, at others somewhat on the side of the ridge. I am thus minute in my account of the ridges, since it is from them that the principal distinctive characters of the fruit are drawn. The channels or furrows are striated, but have no vittæ. The inner face (*commissure*) of each mericarp presents a longitudinal line, or deep narrow furrow, indicative of the involute albumen. The seed, in shape, somewhat resembles the coffee seed of the shops, being arched or convex on the outer side, and nearly flat with a longitudinal furrow on the inner side; but it is somewhat tapering superiorly. The albumen is rolled inwards, at the edge or side (*involute*), so as to form a longitudinal furrow. When examined by the microscope it presents a granular appearance.

MAGNIFIED VIEW OF DRIED HEMLOCK FRUITS.

(*Drawn from the Microscope*).

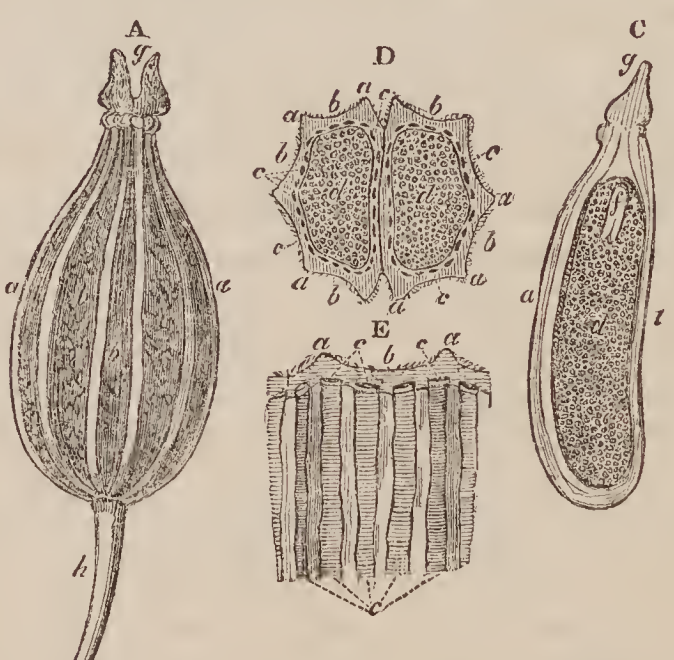


A. A cremocarp. *C.* Longitudinal section of a mericarp.
D. Transverse section of a cremocarp.
a. Ridge. *b.* Channel. *d.* Albumen.
f. Embryo. *g.* Remains of the styles. *i.* Carpophorus.

2. *Anise Fruits.* These are called in the shops *aniseed.* They consist usually of entire fruits (*cremocarps*), each of which is generally provided with a stalk of from two to four lines. Sometimes one half of the fruit (*mericarp*) is abortive, or only imperfectly developed. The entire fruits are ovate, and slightly contracted at the sides; from one line to one and a half line long, and about three-quarters of a line broad, and slightly pubescent. On splitting an entire fruit into its halves (*mericarps*) we see the bifid, free carpophorus to which each is attached. Each half fruit (*mericarp*) has five, paler, filiform, equal, entire ridges; the lateral ones being marginal. The channels are multivittate. The seed is gibbous, convex on its outer side, flattish on its inner face (*commissure*): its albumen is flat, being neither involute nor convolute.

MAGNIFIED VIEW OF ANISE FRUITS

(*Drawn from the Microscope*).



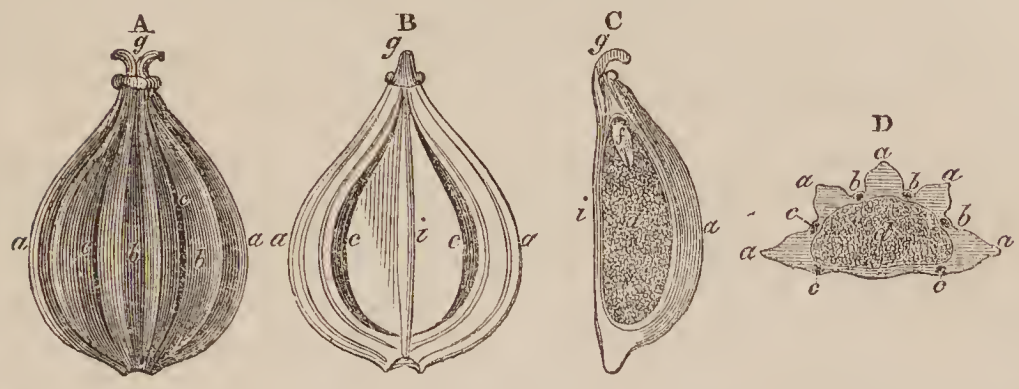
A. A cremocarp. *C.* Longitudinal section of a mericarp. *D.* Transverse section of a cremocarp. *E.* Portion of the pericarp.

a. Ridge. *c.* Vittæ. *f.* Embryo. *h.* Portion of fruit stalk.
b. Channel. *d.* Albumen. *g.* Remains of style.

3. *Fruit of Fool's Parsley.*—This consists of entire fruits (*cremocarps*), and half fruits (*mericarps*), which readily separate from each other. The entire fruit is about one line long, and three-quarters of a line broad; ovate, and lobose. The half fruit (*mericarp*) has five elevated, thick, acute, entire, keeled ridges; the lateral ones being marginal, and surrounded by a slightly winged keel. The channels are univittate. The inner face (*commissure*) of each mericarp is paler, with two reddish brown arched vittæ. The seed is semi-globose; the albumen flat being neither involute nor convolute.

MAGNIFIED VIEW OF FRUIT OF FOOL'S PARSLEY.

(*Drawn from the Microscope*).



A. A cremocarp. *B*. A mericarp, viewed from its inner or commissural surface. *C*. Longitudinal section of mericarp. *D*. Transverse section of ditto.

a. Ridge. *c*. Vittæ. *f*. Embryo.
b. Channel. *d*. Albumen. *g*. Remains of styles.

47, *Finsbury Square*.

NOTES ON THE TALLICOONAH OR KUNDAH OIL.

BY MR. ROBERT CLARKE,

Senior Assistant Surgeon to the Colony of Sierra Leone.

The tree which furnishes the nuts from which Tallicoonah or Kundah oil is procured, is found growing abundantly in the Timneh country and over the colony. At the village of Kent, near Cape Schilling, the oil is manufactured as follows:—The nuts are dried in the sun, then hung up in wicker racks or hurdles, and exposed to the smoke of the huts; when exposed for a sufficient time, the nuts are roasted and subjected to trituration in large wooden mortars until reduced to a pulp. The mass is then boiled, when the supernatant oil is removed by skimming. The natives principally manufacture the oil to afford light; the leaves are used by the Kroomen as a thatch.

I believe the medicinal properties of Tallicoonah or Kundah oil are unknown in Europe. Among the liberated Africans, the Sherbros and Soosoos, the oil is held in high estimation as an anthelmintic, the negroes and all classes of the colonists being very subject to worms. The sort of worms for which Tallicoonah or Kundah Oil proves efficacious are the tape, lumbicus, and ascarides, more especially the two former; administered, however, in the form of enemata, the oil is successful in bringing away great numbers of the latter. When employed as an enema, one or two ounces may be thrown into the bowels, dissolved in warm water, of a temperature sufficient to retain it in the liquid state. I have used it in large doses (as

much as ʒiss) in "Lethargus*," a disease of the brain in which it is desirable to act on the bowels with the most powerful drastic purgatives. Some of the colonists are in the habit of mixing with the palm and nut oils used to afford light, a portion of Tallicoonah oil, to prevent their servants from using the oil with their food.

I have employed it in cases of worms, or where I suspected their existence, in doses proportionate to the age and strength of the patient. In such cases the dose has ranged from one ounce to one drachm, fluid measure. It is here necessary to observe, that its purgative effects were by no means always uniform. In persons of weak habit of body, and in whom there existed any liability to bowel complaints, the Tallicoonah oil, from its acrid bitter properties, would prove injurious; but in persons in the opposite condition of body, I can confidently recommend this medicine as a safe and powerful anthelmintic. The usual way I have administered the oil is precisely similar to the modes in which castor or the other fixed oil are given. If given in proper doses, its purgative effects bear a close resemblance to those of castor oil, both in the length of time that elapses before its operation, and in the bulk of the stools produced. When over doses are taken, it produces the most violent hypercarthasis, cold sweats and vomiting, succeeded by collapse, and if remedial means are not promptly employed, even death. I may observe, that the negroes also use it as an expectorant. The best specimens are liquid, but it is more generally found concrete. The tree grows to the height of forty feet, the nuts being contained in a multelocular capsule. The oil is sold in the colony at two shillings a gallon, and could be procured in abundance from the coast as an article of commerce. I could spare to any of your medical friends, who wish to administer this oil as a remedy, a small quantity. I expect shortly to receive specimens of the root, stem, and leaf, and will forward them on their arrival.†

London, 28th Sept. 1842,
63, *Vauxhall Walk, Lambeth.*

REMARKS ON THE ABOVE PAPER, BY DR. PEREIRA.

"The 'nuts' described in Mr. Clarke's paper, are the seeds of the *Carapa Touloucouna* of the *Flore de Sénégambie*, a Meliaceous plant, figured in Sweet's British Flower Garden (i. 72), and growing in dry places near Itou, on the shores of the Casamancia. The fruit is a large somewhat globular five-celled capsule. The seeds (of which there are from eighteen to thirty in

* See *London Medical Gazette*, Sept. 18, 1840.

† We have just received the specimens.—Ed.

each capsule) vary in size from that of a chestnut to a hen's egg: they are three-cornered, convex on the dorsal surface, of a brownish or blackish red colour, and rugous. Specimens of the seeds with the fruit, are contained in the Banksian Collection at the British Museum. In the *Flore de Sénégambie*, the expressed oil of the seeds is called *Huile de Touloucouna*, and it is described as being sometimes liquid, sometimes solid according to the variable quantities of oleine and strearine which it contains. A notice of its uses is said to be contained in the *Ann. de la Societé Linnéenne de Paris*, for May, 1824, but I have had no opportunity of consulting this work. The oil owes its bitterness to an alkaloid principle, which MM. Petroz and Robinet (*Journal de Pharmacie*, t. vii. p. 48), found also in the bark of the tree."

Mr. Redwood observed, that he had made a few experiments to determine some of the most prominent characters of the oil.—He found it to be entirely soluble in ether, and that alcohol separated it into two parts, a concrete substance, which was dissolved, and an oil fluid at ordinary temperatures, on which the alcohol took no effect. The former contained the bitter principle and the nauseous odour of the oil, the latter was nearly colourless and tasteless.

Some GELATINE CAPSULES, contrived by Mr. Chaston of Walton, in Norfolk, for administering fluid medicines to HORSES and DOGS, were exhibited to the meeting. They were open at one extremity, which required a covering of skin, after the introduction of the fluid. It is scarcely necessary to add, that if water be introduced, they should be administered in the course of a few minutes; but they are chiefly adapted for the administration of spirit of turpentine, or any other substance in which gelatine is insoluble. The horse capsules are about the size of an ordinary horse-ball, and when wrapped up in paper in the usual way, have a similar appearance.

A specimen of FALSE ANGUSTURA BARK, presented to the Society by Dr. Neligan, of Dublin, was on the table. It is the bark of the Strychnos Nux Vomica, and was a few years ago introduced into Germany in considerable quantities, which brought Angustura bark into disrepute.* Among the visitors at the meeting, were Professor Mitscherlich and M. Nordmann, of Berlin.

The Chairman announced that Mr. Redwood, having been prevented by indisposition from addressing the Society on the 28th of last month, would deliver a lecture on the 26th instant, on Heat as a Pharmaceutical Agent.

* A history of this transaction, and notices of the accidents to which it gave rise, are contained in Dr. Pereira's *Elements of Materia Medica*, vol. ii., page 1291, *et seq.* 2d. edition.

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The Elaboratory laid open	1758	Mr. J. Handel Bland (Stourbridge)
Ball's Practice of Physic, 2 vols.	1762	
Ainslie's Materia Medica, 2 vols.	1826	Dr. A. T. Thomson
Sweet's Hortus Suburbanus Londinensis	1818	
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Husson sur de l'Eau Médicinale		
The London Medical Repository, from the year 1814 to 1826 inclusive, 28 vols.		Mr. Bell

DONATIONS TO THE MUSEUM.

Mr. Payne.—HORTUS SICCUS; containing 215 specimens of British plants, and all the indigenous officinals of the London Pharmacopœia, 1837.

Messrs. Godfrey and Cooke.—Galbanum, in massis—Galbanum, in lachrymis—Gummi taeamahaecæ—Opoponax, in lachrymis—Resina elemi—Euphorbium—Hydrargyri oxidum rubrum per se—Lycopodium.

Mr. Gifford, *Strand.*—Myristica officinalis (fructus).

Messrs. Wright and Co., *Edward Street.*—Aloë Socotrina—Aloë hepatica—Aloë de Mochâ—Resina scammonii—Scammonium, No. 2 (virgin)—Ditto, No. 3—Ditto, No. 4—Ditto, No. 5.

Mr. Smith, *Hampstead.*—Fresh plant of Valerian.

Messrs. Howard and Co., *Stratford.*—Æther sulphuricus — Oleum æthereum — Spiritus ætheris nitrici — Spiritus ammoniæ aromaticus — Liquor ammoniæ—Liquor ammoniæ fortior—Linimentum camphoræ compositum—Ammoniæ sesquicarbonas—Creta præcipitata—Calcii chloridum—Potassæ carbonas—Potassæ bicarbonas — Magnesia calcinata — Magnesia calcinata ponderosa——Magnesiæ carbonas ponderosa—Pulvis antimonii compositus — Bismuthi trisnitras — Quinæ disulphas — Argenti nitras—Hydrargyri ammonio-chloridum—Ferri ammonio-chloridum.

Messrs. Davy, Macmurdo, and Co.—Folia diosmæ crenatæ—Radix jalapæ (spurious)—Hydrargyri chloridum—Hydrargyri nitrico-oxydum—Acidum oxalicum—Potassæ superoxalas—Potassæ chloras—Potassii iodidum—Barii chloridum—Calcis carbonas præcipitatum—Zinci oxydum præcipitatum—Zinci oxydum sublimatum—Morphiæ acetas—Morphiæ hydrochloras—Morphiæ sulphas—Ferri sesquioxydum—Sulphur præcipitatum—Oleum Valerianæ—Oleum acori calami.

Mr. Hulse, *Leadenhall Street.*—Cydonia vulgaris (fructus et folia).

Mr. C. J. Hodgson, *Park Lane.*—Crystal of Rock Salt, from Nantwich, Cheshire—Native Lead, from Havod, North Wales—Washed Lead, from ditto—Copper Ore, from Snowdon—Crystal of Quartz.

Mr. Thomas Huxtable, *St. John's Street.*—Sanguis draconis—Ichthyocolla (long staple)

Mr. R. Clarke, *Sierra Leone.*—Carassa Toulouconna, (root, stem, leaves, seeds, and oil).

Mr. Cocking, *Great Portland Street.*—Five jars, containing snakes.

Mr. Bell.—Gummi, tragacanthæ (bad)—Asafœtidæ (bad)—Cambogiæ (rather bad)—Radices, columbæ (ordinary)—Ditto (rather bad)—Chinæ (ordinary)—Ditto (unsound)—Galangæ—Ginseng—Helenii—Ipecacuanhæ (second quality)—Zedoariæ—Rhei Chinæ (bad) — Fructus anisi (good) —Ditto (bad)—Extractum aloes purificatum (P.L.)—Residue from preparation of ditto—Fine Crystal of Rock Salt (colourless)—Ditto (impure)—Betel nuts—Ditto (charred)—Honey-comb—Honey.

The most acceptable donations to the Museum would now be, specimens of Drugs of inferior quality, to exhibit in contrast with the fine specimens already received.

ON THE PHENOMENA OF FERMENTATION.

BY GEORGE FOWNES, PH. D.
Lecturer on Chemistry at Charing Cross Hospital.

HAVING in a former paper* discussed the general nature and character of the phenomena comprehended under the name "fermentation," together with the beautiful explanation of these changes proposed by Liebig, I now proceed to examine a little more closely the subject of the "vinous fermentation," the sole source and origin of alcohol.

It will be remembered that the principle of the explanation above alluded to is the following:—

All chemical compounds owe their permanence and stability to the attractive forces, whatever the real nature of these may be, which retain in intimate union their components; and the amount of this stability, or indisposition to undergo molecular change, will be in direct proportion to the forces exerted. Now it must always happen, when a number of different elements are presented to each other, and *external circumstances do not interfere*, that union will take place between them in the direction of the strongest attractions, giving rise to compounds, which, under the circumstances, are stable and not prone to decomposition.

This is clearly what may be called the common order of things, an order usually followed in all inorganic combinations; the case is, however, widely different when we come to consider the almost countless multitudes of substances included within the domain of organic chemistry; substances which all have had their origin either directly or indirectly under the influence of vitality—perhaps, to speak, in strict terms, under the sway of vegetable life, since we have every reason to believe, at the present moment, that the animal system has no more power to create out of their elements bodies of this class, than we have to do the same thing in our laboratories; its power, like our own, being confined to the mere modification of organic principles already existing, and which were, in the first instance, really and truly made out of the atmosphere by living plants. It is obvious, then, that we have here a new set of conditions totally different from those commonly existing, and the result of this difference is shewn in the peculiarities of molecular arrangement in the elements of the substances in question. Combination here no longer occurs in simple obedience to the law of strongest attraction, but often, on the contrary, in such a way as to leave unsatisfied, as it were, some of the most energetic powers, and to produce a body which, when withdrawn from the protection of

* PHARMACEUTICAL JOURNAL, March 1842, p. 478.

life, must ever be, to a greater or less extent, prone to undergo such a change as shall break up its present constitution in order that its elements may re-unite themselves according to the precedence of their respective affinities.

We have, accordingly, among organic substances bodies possessing all imaginable degrees of permanence, depending upon their comparative simplicity or complexity of constitution, from oxalic acid and oil of turpentine, where great stability prevails, up to albumen and casein and fibrin, whether from the vegetable or the animal world, bodies in which feebleness of constitution is at its maximum, and which are, in consequence, able to resist that decomposition which must inevitably follow from the internal attractions between their constituents *separately*, overbalancing the powers which unite them together as a *whole*, only while they make part of a living being.

In a word, we are justified in regarding all organic substances in the light of compounds whose constituents are *not* united in the direction of the strongest affinities; substances which only exist in virtue of a kind of *vis inertiæ*, and which are in consequence subject to be momentarily destroyed by the influence of any cause capable of exciting molecular movement. Some of the weakest of these bodies cannot resist, even for the shortest period, the action of a little free oxygen; the slightest change commenced, the balance is destroyed, and decomposition proceeds, although the original cause of disturbance be withdrawn. Others, on the contrary, of which sugar may serve as an example, are not affected by causes competent to occasion the destruction of the albuminous principles, but require for the purpose a disturbing force of another kind.

When solutions of chloride of potassium and tartaric acid, moderately dilute, are gently mixed without agitation, and suffered to stand, the formation of cream of tartar is very slight, and confined to a few little crystals, which attach themselves to the glass; but if now the mixture be shaken, or rudely stirred, a most abundant crystalline precipitate of acid tartrate of potash at once makes its appearance. The state of equilibrium between the components of the potash salt in presence of the new acid, although evidently one of instability, *was* nevertheless one of equilibrium, which the mere attractive power of the tartaric acid for the base, was unable, by itself, to overturn, without the aid of motion from without. This position is not affected by any view which may be taken of the real cause of the displacement of one body by the other, concerning which opinions may vary.

Now, a dilute solution of sugar at the fermenting temperature, is in a state resembling that of our quietly made mixture of potash salt and tartaric acid: it is quite ready to undergo de-

composition, nothing restrains it but its own *vis inertiæ;* but then, as matter cannot of itself acquire motion, and as the sugar is not immediately affected by anything to be found in the atmosphere, it remains quiescent until its constituents become excited to movement by a disturbance from without, which disturbance will be, in the case we are about to consider, the *contact of organic matter already in a state of decomposition.*

In the cream of tartar experiment, so nearly were the opposing forces balanced, that mere agitation of mass sufficed to turn the scale: to effect the conversion of sugar into alcohol and carbonic acid we require the more deeply-seated, more potent, more molecular disturbance, communicated by the motions of the elementary components of the decomposing ferment. The change proceeds as long as the disturbance lasts and no longer; when the ferment is destroyed or alters the character of its decay, the formation of alcohol ceases.

Some important observations have lately been made by H. Rose, of Berlin, respecting the susceptibility of different kinds of sugar to undergo vinous fermentation; he finds that in point of fact, the only variety of saccharine principle capable of fermenting is grape sugar, and that when common cane sugar appears to undergo this change, which so readily happens when we dissolve it in tepid water and mix it with yeast, the first thing that happens is the total conversion of the cane into grape sugar. It has been shewn also, that when that peculiar kind of sugar contained in milk is made to furnish alcohol, as in the milk-spirit of the Tartars, a previous change into grape sugar always occurs; so that we are probably justified in considering the last-named substance as the real parent of alcohol.

The following equation will represent what happens during this change:

$$\text{Crystallized Grape Sugar, } C_{12}H_{14}O_{14} = \begin{cases} 2 \text{ eq. Alcohol} \ldots\ldots C^8 H^{12} O^4 \\ 4 \text{ eq. Carb. Acid} \ldots C^4 - O^8 \\ 2 \text{ eq. Water} \ldots\ldots - H^2 O^2 \end{cases}$$

$$C^{12} H^{14} O^{14}$$

When, in the process of wine-making, the expressed juice of the grape is set aside in the fermenting vessels, the first thing that happens appears to be an absorption of oxygen. This is accompanied by turbidity in the liquor, owing to the production of an insoluble substance, which is due to the decay by oxidation of the albuminous matter largely contained in the juice. This light flocculent precipitate of altered albumen in its turn undergoes putrefactive decomposition (even though the influence of the air be now withdrawn), and occasions by the molecular commotion thus excited the change of the sugar into alcohol. That this insoluble substance is really the *ferment* is shown by

filtering a portion of the liquid from the vat, whereupon the emission of gas bubbles ceases, until by exposure to the air a fresh quantity of the wine-yeast is produced, and fermentation begins again.

Matters thus proceed under favourable circumstances of temperature until one of two things happens, namely, either until all the albumen is exhausted by putrefaction, or at least so far altered as to lose its power as a ferment, and to collect undisturbed as a soft muddy mass at the bottom of the vessel; or on the other hand, the action is annihilated by the total disappearance of the sugar. In the case of the more perfect wines, such as Sherry, the latter supposition is probably the true one.

During this gradual passage of sugar into spirit, a large portion of the acid tartrate of potash which the grape-juice contained, is deposited as a crystalline stony incrustation, stained with colouring matter and contaminated with other impurities. It is from this substance, known in commerce under the name of argol or crude tartar, that all the tartaric acid we have is obtained. It is well known that tartaric acid is a most important article of trade; it is consumed by the calico-printer in very large quantities, besides being applied to other purposes in the shape of cream of tartar. Our only available source of tartaric acid is the one described, and it would be highly desirable if some method of artificially preparing it, as we now do oxalic acid out of sugar, could be discovered; its complicated constitution, however, renders success very doubtful.

We can easily render an account of the cause of the slow deposition of argol during the formation of alcohol in the juice or "must" as it is called; if we bear in mind the fact, that although cream of tartar is soluble to a considerable extent in water, requiring about sixty parts, it is very far less soluble in dilute alcohol, and slowly separates as the latter substance makes its appearance. Hence the circumstance of strong wines being feebly acidulous, while those deficient in alcohol, like the wines of the Rhine and Moselle, are extremely rich in cream of tartar.

It is to the accident, as it were, of grape juice containing tartaric acid, instead of malic or citric, the ordinary acids of fruits, that it owes its peculiar fitness for the purpose to which we apply it;—the acidity and sweetness disappear together, and our liquor acquires that character to which the term "dry" is applied, and which is desirable, both on account of its adaptation to the palate and its wholesomeness.

In the so called home-made wines so much in use in this country some years ago, where the juice of currants and gooseberries is substituted for that of grapes, the acid could not be removed in the manner described, the acid malate and citrate of potash

being freely soluble in an alcoholic liquid, and the only resource was to cover or disguise the disagreeable sourness by a large addition of sugar. Such liquors were, consequently ascescent—subject to disagree with those whose digestive powers were feeble.

The art of the brewer is one of great importance, since by him we are supplied with a cheap and agreeable substitute for wine, in those localities where the climate is too rigorous for the cultivation of the grape. The preparation of a stimulating drink from germinated grain is an art of very high antiquity; the addition of the hop-bitter appears to be a comparatively modern practice.

The malt at present used is made exclusively from barley, by a method sufficiently simple. It is steeped in water for some time, and afterwards suffered to remain in this moist condition until the germ has attained a certain length, particular precautions being taken to maintain the temperature most suitable to each step of the process. When the maltster judges his grain sufficiently grown, he puts a stop to the further development of the embryo, by thoroughly drying it at a high temperature; the malt is now fit for use, and in this state, freed by sifting from the dried and broken radicle, it comes into the hands of the brewer.

Now, during germination a great change has taken place in the chemical composition of the seed; a notable quantity of its starch has passed into the condition of grape sugar, and become soluble, while the gluten, or azotized portion, has undergone partial decomposition, giving rise to a certain quantity of a most extraordinary substance called "diastase," which possesses the power of inducing the conversion of starch into grape-sugar.

It is a matter of regret that our information on this subject is yet very scanty; diastase, in its external characters, very much resembles albumen; like that substance it is coagulated by boiling, and rendered insoluble and inactive; it is freely dissolved by cold water, and precipitated by alcohol. It contains nitrogen, but its exact composition is unknown.

The simplest experiment for illustrating the specific property of this curious body is to add to a quantity of warm thick gelatinous starch, a little infusion of common malt made with tepid water, and then maintain the whole at a temperature which does not much exceed 160° Fahr. In the course of a very few minutes, the starch, before so thick that the vessel might be inverted without spilling any, becomes as limpid and thin as water. It is now "dextrin" or starch-gum, a state intermediate between ordinary starch and sugar. If the temperature be still kept up, in the course of some hours, depending upon the quantity of malt-infusion used, the liquid will have acquired a sweet taste, and have become, in fact, a solution of grape sugar.

This is the principle of the first step towards the manufacture of beer, and which is called "mashing," its object is to get a saccharine liquid susceptible of fermentation. The practice is as follows:—The malt, roughly ground, or rather crushed, between rollers, is placed in a spacious wooden vessel or "mash tun," furnished with a false bottom pierced with small holes, like a colander, and raised a little space above the true bottom. A stop-cock, placed between the two, communicates with an exit-pipe. The due proportion of water, regulated of course by the quality of the liquor required, which has meanwhile been heating to the proper temperature in a large copper boiler close at hand, is now let on, and the mixture in the tun, after due agitation, either by machinery or by hand, is closely covered up to prevent loss of heat, and suffered to remain during a space of time varying from two to four hours. In this interval the greater part of the starch of the grain, which had escaped unaltered during the malting, is, by the action of the diastase before mentioned, converted into soluble mucilaginous matter and sugar, the liquid, or "wort," acquiring a degree of sweetness incomparably greater than could have been communicated by the sugar actually contained in the malt itself.

So soon as this change is judged to be sufficiently advanced, the stop-cock is carefully opened, and the clear liquor drained away from the mash-tun into a vessel provided for its reception. As the malt by this one operation is never completely exhausted, and retains besides, mechanically, like a sponge, a large quantity of wort, it is usual to repeat the mashing with a second and even a third portion of water, each a little hotter than the preceding. The temperature of the water is a matter of great importance, since, if it be too cold, the maximum quantity of extract is not reached; and if too hot, the diastase is coagulated, and the operation of course ruined; 140° to 160° are about the limits.

The sweet-wort so obtained is next transferred to a copper and boiled for some hours, with a proper proportion of the dried flowers of the hop, the object of which proceeding is to communicate the pleasant bitter which good beer possesses, and also to render it less subject to change by keeping. This bitterness appears to reside in a substance, most abundant in the peculiar dusty yellow powder scattered over the hop-flowers, to which the name "lupulin" has been given; this has been but very imperfectly examined, but, from what is known, appears to possess the characters of a bitter resin, not perhaps unlike that contained in cascarilla bark. Besides lupulin, hops contain an essential oil, which probably acts beneficially upon the liquor; the odour of this oil will be familiar to every one who has passed

a brewery where wort was boiling. An exact chemical examination of the proximate principles of the hop is yet wanting, and would probably well reward the inquirer.

It is very requisite that this "hopping" take place as soon as possible after the preparation of the wort; exposure to air, even for a very short period, and in spite of the high temperature the liquor yet possesses, is extremely apt to generate acidity, from the greediness with which the soluble azotised matter present absorbs oxygen and begins to decompose, no delay therefore must take place.

The boiling terminated, the liquor is drawn from the exhausted hops, and cooled down as rapidly as possible, by various contrivances, to near the temperature of the air, after which it is run off into suitable vessels, often of very large dimensions, in which the fermentation is to be conducted.

But now the liquor has been boiled, any thing in the shape of vegetable albumen must have been thereby coagulated, so that it no longer resembles the juice of the grape in the property of undergoing spontaneously the vinous fermentation. It is true, that boiled wort will ferment after a fashion, but in a very slow and imperfect manner, and the product will be very offensive from putrid decay; so that some means must be contrived for restoring to the liquor this particular power. It becomes necessary, in short, to treat it as we should a solution of pure sugar, and quickly excite the proper kind of fermentation by an addition of yeast.

A few hours after the dose of yeast has been given, its effects become manifest, a froth appears upon the surface of the liquid, the whole becomes muddy, carbonic acid gas begins to be evolved, the temperature rises, and, in short, a fermentive process of great energy is set up. Now it is that the skill and judgment of the brewer principally show themselves; this is the critical part of the operation, because the future excellence of the beer will depend very greatly indeed upon a proper regulation of the temperature of the mass of liquid, and on the extent to which the fermentation is suffered to go; it is requisite that a certain portion, and no more, of the sugar shall be destroyed. The operator takes in great measure for his guide, the constantly dimishing density, or "attenuation," as he calls it, of the liquor, resulting at once from the disappearance of sugar, and the production of alcohol, and when he thinks the change sufficiently advanced, he puts a stop, or, more correctly speaking, a check, to the fermentation by "cleansing."

This cleansing consists in separating, as completely as possible, the yeast from the beer. The great bulk of the yeast, generated by the decomposition of the azotized matter of the wort during

fermentation, is deposited at the bottom of the vessel in which that process is carried on, but still a certain amount remains diffused through the liquid, and unless this be got rid of, the fermentation will still proceed until the beer becomes ruined by the total destruction of its saccharine matter, and perhaps also by the passage of some of the alcohol into acetic acid by the oxygen of the air finding its way into the cask. By putting the liquor into vessels *completely* filled, and only communicating with the air by a small aperture in the upper part, the yeast is gradually got rid of, some working out at the top, and some sinking to the bottom, so that in the end the liquor becomes clear and tranquil.

It must not be imagined, however, that the matter ends here altogether; beer (and the same observation applies to wine) continues in a state of unceasing, although for the most part insensible, change; every one knows that well-preserved old beer is less sweet and more spirituous than new, it has lost its clamminess, and has acquired somewhat of a vinous character. These changes are the result of a slow and, as it were, imperceptible fermentation, which is said, nevertheless, at certain periods, in the spring of the year for instance, to assume a sort of activity, the liquor being then described to be "out of condition;" we may perhaps trace this effect to the rise of temperature after the winter months.

(To be concluded in our next.)

HINTS ON THE ACTION OF BISULPHURET OF CARBON*, &c.

TO THE EDITOR OF THE PHARMACEUTICAL JOURNAL.

Sir,

In October, 1841, I gave an account of the action of the vapour of *hydrocyanic acid* upon diseases of the eye. Since that period I have been engaged in investigating the action of various other bodies on the same organ, and under the same form.

One reason why I did not rest satisfied with the great effects produced by the *hydrocyanic acid* was, that its action, like that of all other medicines, decreased in power by continued application, thereby rendering it necessary to have occasional recourse

* According to Wutzer (quoted by Wilmer in his *Wirkung der Arzneimittel und Gifte*, vol. ii., p. 41), bisulphuret of carbon is a very diffusible stimulant, accelerating the heart's action, augmenting temperature, and exciting the secretions of the skin, kidneys, and genital organs. It has been used both internally and externally in gout, rheumatism, and some other complaints. The dose of it is from five to twenty drops. It may be taken in spirit or syrup. (For further details concerning its effects, uses, &c., see Adolf Duflos, *Pharmakologische Chemie*, p. 195. Breslau, 1842.)—Ed.

o other medicines, in order to ensure a more speedy recovery. Another reason was, the reluctance of many individuals to submit the eye to the action of so potent a medicine.

The first medicines to which I shall refer, and which I have employed with some success, are the *chlorocyanic acid* and *sulphuretted chyazic acid.** The plan I pursue is that of putting a drachm of one of the medicines into a bottle (containing a small piece of sponge) of about two-ounce size, having a mouth precisely fitted to the eye, and with a ground-glass stopper.

The action of these medicines is very different from that of the *hydrocyanic acid*, in as far as they both stimulate the eye, and produce much greater warmth and irritation, with less dilatation of the pupil. Few, however, can bear the *chlorocyanic acid* to be applied longer to the eye than half a minute, though in a minute after its application all irritation is removed, and the eye feels perfectly at ease.

The next medicine which I have employed in the form of vapour, was the *chloruret of iodine*. This medicine produces very little warmth or uneasiness to the eye, if continued for the space of two minutes or upwards, but a sensation of irritation, accompanied with a flow of tears, takes place on its removal. It contracts the pupil, and in no case have I seen it dilate it. Its vapour rises very readily, and does not leave the yellow disagreeable colouring on the skin produced by the vapour of *iodine*, when uncombined; which is a great drawback in the use of *iodine* in diseases of the eye.

The last medicine which I have employed is the *bisulphuret of carbon*, which is so volatile that the application of it to the eye, when the bottle is held in a warm hand for a few seconds, is as much as can be borne, in consequence of the intense pricking heat and flow of tears which it occasions. Owing to this fact, I generally use it by causing the patient to shut the eye-lid during its application, which can then be continued for a minute or two with the same beneficial effect upon the eye, and without inconvenience to the patient. It generally contracts the pupil, and very seldom dilates it.

I used to employ *iodine* by putting it into the same bottles, and immersing it in hot water, and in its state of vapour applying it to the eye, but I now find it answers much better when dissolved in the *bisulphuret of carbon*.

It is my intention shortly to give a full account of the action of these medicines upon the various forms of disease to which the eye is subject, and also what particular disease each medicine is best calculated to remove. At the same time I shall state such

* The *sulphuretted chyazic acid* was discovered in 1808, by M. Porrett, who at first called it *Prussous acid*; it is now generally termed *hydrosulphocyanic acid*.—Ed.

instances of failure, as have occurred in my experience, in order that a just estimate may be formed of the value and importance of each medicine.

It may not be out of place here to state, that I have employed, with great success, the *bisulphuret of carbon* to enlarged indurated lymphatic glands. In the first instance, I rubbed equal quantities of the *bisulphuret of carbon* and *alcohol* upon the parts affected, but without any effect upon the glands. But as its effects were so great when its vapour was confined to the eye, I was led to apply it in the form of vapour, and by means of glass bottles similar to those I have described. By these means I excluded the action of the medicine from the external air, and thereby prevented its speedy evaporation. When it had been applied about one minute the patient felt the part very cold, but immediately after a gradual heat, accompanied with great prickling—the heat increasing the longer the medicine was kept in contact with the part until it could no longer be endured. On removing the glass, the part was red to an extent two or three times greater than the part enclosed. In a few days the change in the size of the glands was very great, and by its daily repetition a complete and speedy removal of the disease was effected. I also find that its action upon diseased glands is more decided if the surface of the skin is well moistened with water, previous to the application of the bottle to the part.

The water, in fact, not only prevents the escape of the vapour between the glass and the skin, but assists the imbibition of the *carbon*, a point of the highest importance, inasmuch as its action on the part depends upon the exclusion of the atmosphere from the vapour. I may here observe, that these applications occasion no injury whatever to the skin.

I have also found the *bisulphuret of carbon* and the *chlorocyanic acid* valuable medicines in the removal of deafness, depending upon a want of nervous energy and deficiency of wax. The mode of its application is substantially the same as that which I employ in diseases of the eye, with this difference only, that the bottle is formed with a small neck and stopper adapted to the size of the orifice of the ear, and held close to the organ until a considerable degree of warmth is produced.

There can be no doubt of the usefulness of bisulphuret of carbon in skin diseases.

I have submitted these observations under the conviction that they embody principles which may be carried out, and made of great utility to mankind.

I am, Sir,

Your obedient Servant,

Oct. 20*th*, 1842, 48, *Russell Square.* A. TURNBULL, M.D.

THE SOLUBILITY OF LEAD IN ALL WATER CONTAINING FREE CARBONIC ACID.

TO THE EDITOR OF THE PHARMACEUTICAL JOURNAL.

My dear Sir,

I am most anxious to communicate to you, in your Editorial capacity, a chemical discovery, mentioned to me a day or two since, by Professor Daniel of King's College, which he has kindly permitted me so to communicate, and a general knowledge of which is, in my opinion, highly important.

You and most of your readers are well aware, that it is the generally received opinion of Chemists, that spring or river water containing salts of lime, &c., will not dissolve lead or its salts, if kept in or transmitted through that metal, although pure distilled water will hold a considerable quantity in solution. Professor Daniel's attention having been directed, in consequence of some severe cases of Colic in the neighbourhood of his residence at Norwood, to the examination of the water, found, to his astonishment, that it contained lead in large quantity, and has established the fact, that in all cases of water containing *Free Carbonic Acid*, lead is readily dissolved, and cannot therefore be safely kept in, or transmitted through that metal.

Now, my dear Sir, at this moment when you are so strongly advocating the necessity of absolute chemical purity in medical substances, even when given in Homœopathic doses, you will, I am sure, be anxious to give to your readers immediately this truly important fact, which unless attended to, may *in certain localities* produce much mischief.

I am, your's ever truly, T. N. R. Morson.

Southampton Row, Oct. 21st, 1842.

PURIFICATION OF NITRIC ACID.

BY M. E. MILLON.

The ordinary methods of purifying nitric acid by nitrate of silver, nitrate of baryta, or litharge, and desiccation, always leaves in the product a certain quantity of nitrous acid, which exercises a marked influence on the properties of the acid. The aqueous solution of hydrosulphuric acid has been adopted by M. Millon, as the best test for the presence of nitrous acid. The nitric acid to be tried should be diluted with once or twice its volume of water; the least trace of nitrous acid causes the liberation of sulphur, which gives an opalescent appearance to the liquor. At the same time, a small quantity of ammonia is formed.

When the nitric acid contains no organic matter, it may be

obtained free from nitrous acid, by setting apart the first products of its distillation, which contains the whole of the nitrous acid; but the best and surest method to adopt, even when the acid contains organic matter, is, according to M. Millon, to mix bichromate of potash with the acid to be purified, in the proportions of one part to one hundred of acid. The nitrous acid is transformed into nitric acid at the expense of the oxygen of the chromic acid.

This addition is sufficient for the purification of nitric acid, the density of which does not surpass 1.48; but for acid of a greater density than this, it is necessary to resort to other means, for the acid is decomposed under the influence of heat, and cannot be distilled.

In preparing the concentrated acid from the acid of commerce, it is well to separate, by distillation, the first third of the acid, putting into the retort some platinum wire, or what is better, spongy platinum. There will thus be drawn off, in the first third of the acid, more than half the water it originally contained.

There is then to be added to the residue remaining in the retort, its volume of concentrated sulphuric acid; a very dense acid will be obtained by the first distillation, and this may be brought to the highest state of concentration by repeated distillations. During the distillation from sulphuric acid, the nitric acid carries over an appreciable quantity with it; on the other hand, the sulphuric acid in the retort retains a portion of the nitric acid, although the temperature be raised to 680° Fahr. The combination of sulphuric and nitric acids described by Kulmann, is no doubt formed here, and which, as is seen, is decomposed with great difficulty. When the decomposition is effected, pure oxygen is disengaged, and there remains in the vessel a combination of sulphuric acid and deutoxide of azote.

When the nitric acid has been separated, by a second distillation, from the sulphuric acid which it had carried over, it always contains a large quantity of nitrous acid. When in this state, it should be put into the vessel in which it is intended to be kept, and the temperature being raised to the boiling-point, a current of dry carbonic acid should be passed through it. It should then be allowed to cool, still continuing the current of gas. If the density of the acid does not exceed 1.50, one operation of this kind will be sufficient to render it colourless; but with more concentrated acid, it is necessary to raise the temperature to ebullition, two or even three times.

In those cases where, after the first purification, the acid is nearly colourless, the purification may be completed by adding some fragments of white nitrate of urea.

The most concentrated acid that M. Millon was able to obtain by the application of heat and a current of carbonic acid gas,

was perfectly colourless, very fuming, and not rendered turbid by sulphuretted hydrogen, when diluted with two or three volumes of water. According to the analyses of M. Millon, this concentrated acid contains exactly one equivalent of water, and represents the first degree of hydratation of nitric acid. According to calculation, the equivalent would be 14.24 to 100. Experience gives 15.07 for an acid, the density of which is 1.521 at 50° Fahr.

It has been generally admitted that concentrated nitric acid enters into ebullition at 187° Fahr. According to M. Millon, this appears not to be a fixed point, being retained only for a few moments by all the acids of a greater density than 1.50, 194°, 222°, and 232° Fahr., are analogous points, which occur, according to the quantity of the liquid, its density, the application of the heat, and several other circumstances, without the acid being fixed in its constitution. All the others contain a considerable quantity of nitrous acid, of which the heat alone does not deprive them. Thus nitric acid comes over in distillation mixed with nitrous acid, and its boiling point rises until it arrives at 253° Fahr. The acid which subsequently distils is colourless, and causes no precipitation with sulphuretted hydrogen. Its density is 1.484 at 64° Fahr., this is an acid with two equivalents of water. It is only obtained to any extent in operating upon a large quantity of very concentrated acid. Seventeen pints afford about one pint. If the distillation be continued, the acid becomes more and more weak, until it arrives at that state of hydratation, at which it possesses considerable stability: it then contains four equivalents of water.

The general law relating to this distillation, has been well characterized by Dalton, who established one principle — that concentrated nitric acid becomes progressively weaker by distillation, whilst a weak acid is rendered stronger. M. Millon has observed, however, that the form of the retort in which the acid is distilled, and the presence of platinum wire, are capable of changing the point of ebullition, and even the nature of the product. In fact, in distilling a weak acid, without platinum wire, at a temperature from 257° to 262° Fahr., while the temperature was rapidly rising, an acid was obtained of the density 1.20; on putting platinum wire into the retort, the point of ebullition fell to 252°, but the acid collected had only a specific gravity 1.175, instead of following the general rule with regard to the increasing density.

In distilling either a concentrated or a weak acid, the distillation of the last third of it presents some remarkable phenomena. A period arrives when the ebullition ceases; at the same time the thermometer, which stood at 250° or 252° Fahr., rises to 266°, or even 273°, and the acid passes into the receiver with great

rapidity, without any appearance of bubbling or agitation; but it generally happens, that, in a few minutes there is suddenly disengaged an evolution of vapour, coloured yellow by nitrous acid; the thermometer falls 14° or 18° Fahr., and in a few moments the ebullition recommences.

M. Millon concludes from these experiments, in relation to the distillation of the concentrated and the weak nitric acid, that the latter arrives at a state of hydratation, at which it contains four and a half equivalents of water, and has a density not greater than 1.405, at 68° Fahr., while the former tends to stop at a point at which its density is 1.419, and which contains four equivalents of water.

We may, therefore, obtain, says M. Millon, by the processes which I have described, four hydrates of nitric acid.

$$Az\ O_5\ \ H\ O$$
$$Az\ O_5\ 2\ H\ O$$
$$Az\ O_5\ 4\ H\ O$$
$$Az\ O_5\ 4\ H\ O\frac{HO}{2}$$

—*Journal de Pharmacie.*

THE METAL DIDYM.

The seventh number of Poggendorff's Journal, contains a notice of the metal which Professor Mosander has recently discovered united with oxide of cerium, in which body he had previously discovered lanthanium. This metal Professor Mosander has called *didym* (as being the *twin-brother* of lanthanium); he has not yet discovered any good method of effecting its complete isolation. The oxide of didym imparts to the oxide of cerium its brown colour, and also confers on certain salts of yttria, a more or less deep rose-red, or amethyst hue. Pure oxide of cerium and pure oxide of lanthanium are almost colourless. Hydrated oxide of cerium has a sulphur yellow colour. Sulphate of didym has a tint intermediate between rose-red and amethyst. When the brown oxide of didym is subjected to a strong red heat, it loses its colour and assumes a dirty white appearance. Its density does not however seem changed. *Poggendorff's Annalen*, No. 7, 1842. p. 503.

ON THE SACCHARINE MATTERS CONTAINED IN THE BEET-ROOT AND INDIAN CORN.

BY M. PELOUZE.

In a work I published twelve years ago, I mentioned, contrary to the opinion which was then generally received, that the beet-root contains no other saccharine matter, but crystallizable sugar; that is to say, sugar identical with that of the cane. This fact, which has been lately confirmed by M. Peligot, and extended

by him to the cane itself, appeared to me to be placed beyond all doubt, when M. Biot, at the last meeting of the Academy, communicated the result of the researches which he had undertaken with M. Soubeiran, on the saccharine products of Indian corn.

According to these Chemists, two different species of sugar exist simultaneously in the Indian corn; and, by analogy, we may suppose the beet-root, and cane also, to contain a small quantity of sugar different from cane sugar. I thought it necessary, therefore, to verify my former results by fresh experiments.

M. Frommer has lately applied to the qualitative analysis of sugars, the property which all these substances, excepting cane-sugar, possess, of easily reducing the salts of copper mixed with an alkaline liquor.

I first satisfied myself of the sensibility of this test: it is such, that I have detected the presence of grape sugar in water, which contained only about the fifteenth part of a grain to a quart, although combined with very different quantities of cane-sugar.

I have proved, in the second place, that the juice of the beet-root contains none other than crystallizable sugar, when care is taken to examine it at the moment of its extraction. M. Frommer's re-agent causes no turbidness, even at 212°.

On the other hand, on adding to a quart of beet-root juice, a few drops of the liquid expressed from a single grape, it is very easy immediately to discover the presence of the second species of sugar in the mixture.

The juice of beet-root, left to itself, speedily undergoes a change, and after some hours, the presence of the second species of sugar may be detected.

The juice extracted from the stalks of Indian corn affords, with the alkaline sulphate of copper, indications of the presence of other sugar, besides cane-sugar. This result accords with that announced by MM. Biot and Soubeiran.

I may add, in concluding this note, that one of my pupils, M. Barresvil, after overcoming numerous difficulties, has discovered the means of applying M. Frommer's process, with some modifications, to the quantitative analysis of sugars.—*Comptes Rendus.*

COMPOUND DECOCTION OF ALOES.

Mr. Bland has favoured us with the following remarks on this subject:—

"The decoction of aloes, as usually met with, deposits on standing, a copious and unsightly precipitate; this I consider arises from one of the following causes: either, first, the impurities contained in the extract of liquorice; second, the im-

perfect solution of the aloes and myrrh; or third, the decomposition of the aloes. With respect to the extract of liquorice, I find it difficult to procure it sufficiently pure; I, therefore, always use the common Italian liquorice (Solazzi juice) having first purified it by dissolving in distilled water at 60°, and filtering the solution; a large quantity of impurity, consisting of ligneous matter, copper scrapings, &c. is separated, and a pure fine flavoured solution of liquorice is the result. Having thus got rid of the first source of difficulty, I proceed as follows:—rub together the aloes, myrrh and carbonate of potash, add the solution of liquorice*, the rest of the distilled water and the saffron, and boil gently until reduced to the proper quantity, set aside the decoction until cold, strain through any substance of rather open texture, (a piece of muslin answers quite well) and add the tincture of cardamoms; during the next 48 hours a slight precipitate falls, after which no further change takes place. It is necessary that *distilled* water should be used, that the myrrh and aloes should first be well mixed with the carbonate of potash (not added indiscriminately to the water), and that the tincture of cardamoms should be made with *proof* spirit, and not with a mixture of equal parts of rectified spirit and water, as sometimes practised. By attending to these directions, an efficient and uniform preparation may be always depended upon, and decoction of aloes thus made will keep perfectly well in a cool place for several months. The separate maceration of the saffron, as proposed by your correspondent in last month's Journal, would perhaps be desirable, as I find that the colour of saffron (its only valuable property) is injured by boiling. I consider that a resinous soap is formed by the combination of the potash with the resin of the myrrh and aloes, and that the soap is *dissolved* and not held mechanically in suspension, for decoction of aloes is, if carefully prepared, perfectly bright, and in this state it is sent out from Apothecaries' Hall."

Mr. Tyson particularly objects to the use of Spanish liquorice, and thinks only the English extract should be used. He also objects to the myrrh, which he considers "worse than superfluous," and recommends English saffron.

Mr. Fisher (of Ramsgate) states, as the result of his experiments on the Compound Decoction of Aloes, that cold maceration is a much better process than the boiling, which is usually adopted. We have seen a sample of the preparation made in this manner, the ingredients having been merely macerated

* We doubt whether any advantage is derived from boiling the extract of liquorice, which may be dissolved in a portion of the water, and added to the solution of myrrh, aloes, and potash, after the subsidence has taken place. —Ed.

together for two or three weeks, and its appearance, flavour, and smell were remarkably good. We are informed by the maker of this decoction, that its effect is uniform and satisfactory, that it is always bright, and retains its properties longer than the decoction prepared in the usual way. With respect to the extract of liquorice, it is evident, that if the foreign be employed, it ought previously to be purified, as Solazzi juice contains generally between thirty and forty per cent. of impurities. English saffron is an article with which we are not acquainted.

IMPROVED METHOD OF ADMINISTERING COD LIVER OIL.

Dr. Ure has suggested the adoption of cod livers as a diet for patients who are recommended to take the oil. In order to prevent the loss of oil during the process of cooking, he recommends the livers to be immersed entire in boiling water, to which a sufficient quantity of salt has been added, to raise the boiling point to about 220° Fahr. The sudden application of this high temperature coagulates the albumen of the liver, and prevents the escape of the oil. When the liver is cut, the oil exudes, and mashed potato may be used as a vehicle. Dr. Ure informs us, that having been advised to take cod-liver oil, he found the nauseous flavour very objectionable, until he contrived the above plan, which he finds to answer extremely well.

ON THE FORMATION OF PHOTOGRAPHIC IMAGES.

BY M. MŒSER.

M. Regnault presented a paper by M. Mœser, on the above subject, to the Academy of Sciences of Paris, on the 29th of August last, in which the author arrives at the following conclusions:—

1st. Light acts upon all bodies, and upon all in the same manner: the effects hitherto observed, are only particular instances of this general law.

2. The action of light consists in modifying bodies in such a manner, that after this action they absorb certain vapours which they could not otherwise; the process of M. Daguerre depends on this, and offers a particular instance of this general action.

3. The vapours are condensed, more or less strongly, by the bodies thus modified, according to their elasticity, and the intensity of the action of the light.

4. Iodide of silver, as is known, becomes blackened under the influence of light.

5. If the action of the light be continued, the iodide is transformed and becomes coloured.

6. The differently refrangible rays have one and the same action, and differ only in the time they require to produce a given effect.

7. The blue and violet rays, and the obscure rays discovered by Ritter,

commence the action very speedily on iodide of silver; the other rays require, to produce the same effect, as much more time as their refrangibility is less.

8. Yet the action (5) is more quickly commenced and effected by the red and the yellow rays; the others requiring more time, as they have a greater refrangibility.

9. All bodies radiate light, even in perfect darkness.

10. This light does not appear to belong to phosphorescence, for no difference can be discovered, whether the bodies be placed for a long time in the dark, or whether they be exposed to the light of day, or even to the direct rays of the sun.

11. The rays emanating from different bodies operate in the same manner as sensible light, and produce the effects indicated at (2) and (4).

12. These rays, insensible to the retina, have a greater refrangibility than those of the sun, whether direct or diffused.

13. Two bodies constantly imprint their images on each other, even when placed in perfect darkness (1), (9), and (11).

14. Yet for these images to be appreciable, it is necessary, in consequence of the divergence of the rays, that the bodies shall not be very distant.

15. To render the representation of a body visible, some vapour should be used, such as the vapour of water, of mercury, iodine, chlorine, bromide, or chloride of iodine, &c. &c.

16. As the rays which bodies spontaneously emit have a greater refrangibility than those which were previously known, they generally commence the action on other bodies with the greatest intensity. (7)

17. There exists latent light as well as latent heat.

18. When a liquid is vapourized, light, corresponding to a certain degree of oscillation, becomes latent, and is again set at liberty, when the vapour condenses into liquid drops.

19. It is on this account that the condensation of vapour produces to a certain extent the same effects as light: thus is explained the action of vapour as noticed (2) and (15).

20. The condensation of vapours on the plates acts in the same manner as light, whether the excess of vapour simply adheres, as is the case with the vapour of water on most substances; whether it adheres permanently, as in the case of mercury; or lastly, whether it chemically combines with the substance, as does the vapour of iodine with silver.

21. The latent light of the vapour of mercury is yellow; all the effects produced by the yellow rays may be obtained by the condensation of the vapour of mercury.

22. The latest light of the vapour of iodine is blue or violet; the action of the blue or violet rays may in like manner, as in the former instance, be produced by the vapour of iodine.

23. The latent light of chlorine, bromine, chloride and bromide of iodine, appear to differ but little in refrangibility from that of iodine.

24. With regard to the colour of the latent light of the vapour of water, I can only say that it is neither green, nor yellow, nor orange, nor red.

25. Iodide of silver owes its sensibility in contact with the visible rays, to the latent light of the vapour of iodine.

26. Iodide of silver is not more sensible to the invisible rays than is the silver itself.

Remark.—With the exception of the principles contained in 9, 17, 18, and 25, all the preceding are deduced from numerous researches, which are described in the following papers in the "*Annales de Physique de Poggendorff*," &c.

(*a*) *De la marche de la vue, et de l'action de la lumière sur tous les corps.*

(*b*) Sur l'état latent de la lumière.

(*c*) Sur la lumière invisible.

All theoretical views will be discarded, if we reject the principles contained in 9, 17, 18, 25 ; but there will then be a deficiency in the explanation of the phenomena.

M. Arago communicated to the Academy the following letter from M. Brequet, relative to a phenomenon which tends to confirm the experiments of M. Mœser.

"The remarkable facts discovered by Professor Mœser, and which have been communicated to the Academy by M. Regnault, have brought to my recollection something analogous, which I have observed at different times in the interior of gold watch-cases, and even in the interior of the works, which are made altogether of yellow copper.

"Every one knows that on opening the case of a watch, there is a second case below it on which is engraved the name of the maker. This second case comes very close to the first, and I have frequently seen on the outer case the image, reversed and very distinct, of the name of the maker, which is engraved on the inner case.

"In the works of watches where the parts are placed very near to each other, I have sometimes seen certain images, more or less remarkable.

"I have observed these curious facts, and have even mentioned them to some individuals ; but not having had the time to observe all the peculiarities of the phenomenon, I have not until now made them public."—*Comptes Rendus.*

SIMPLE PROCESS FOR DETECTING THE PRESENCE OF MINUTE QUANTITIES OF IODIDE IN THE BROMIDES OF THE ALKALIES.

BY M. LASSAIGNE.

The presence of the iodides of the alkalies in the bromides, which are now prepared by chemical manufacturers with bromine, obtained from the mother-waters of sea-salt works, is more frequent than may be supposed. This circumstance arises, as is known to Chemists, from the difficulty of isolating bromine, which is liquid at ordinary temperatures, from small portions of iodine found in the state of bromide.

Various samples of bromide of potassium, met with in commerce, have always afforded to M. Lassaigne a very small quantity of iodine ; and it has been by means of the very delicate indication of the presence of free iodine which starch affords, that he has been able to make this observation.

On adding to a solution of the bromide of potassium to be examined, a few drops of a weak solution of chlorine, the liquor will be immediately coloured yellow ; if now a piece of white starched paper be introduced, it will be coloured violet, or feeble indigo blue. This colouration depends upon the proportion of iodine set at liberty by the first addition of chlorine to the impure bromide.

When a sufficient quantity of the solution of chlorine is added, to decompose the bromide of potassium, the starch-paper is not immediately coloured ; for, in this case, the iodine exists in the liquor in the state of bromide, which does not act on the starch ; but these remarkable phenomena are presented, the paper being removed from the liquor and exposed to the air, the wetted part assumes a red tint in about a minute or two ; in then turns to violet, and, lastly, becomes blue. The same re-action takes place, but not in so short a time, if the starch-paper be allowed to remain in the liquor.

This effect, which is no doubt due to the decomposition of the bromide of iodine by the organic matter of the paper, and probably by the starch itself, affords the means of detecting the minutest quantities of iodine in the bromides of the alkalies.—*Journal de Chimie Médicale.*

PROCESS FOR THE PREPARATION OF OXYGEN GAS.

"If chlorate of potash be mixed with half its weight of peroxide of manganese, oxide of copper, or several other oxides, and the resulting mixture heated, it soon becomes red-hot in some point, and the process of ignition gradually spreads throughout the mass. In this way the chlorate of potash is so speedily converted into chloride of potassium and oxygen, that in the course of a few minutes a gasometer may be filled. The metallic oxides suffer no change, they act merely as substances of contact—a point to be afterwards explained. This is the most convenient method to procure oxygen in quantity; to fill an ordinary-sized gasometer, about three ounces of chlorate of potash are required."—*Mitscherlich, Lehrbuch der Chemie*, p. 11.

The above process was first pointed out by Döbereiner, about fifteen years ago.

ON THE TRANSFORMATION OF CALOMEL INTO CORROSIVE SUBLIMATE,

UNDER THE INFLUENCE OF THE CHLORIDES OF THE ALKALIES.

BY M. LEPAGE.

M. J. Righini D'Ollegio, in a note relative to the action of steam on the protochloride of mercury, has given the result of some experiments which he undertook with the view of determining whether, as has been stated latterly, the protochloride of mercury is transformed into the perchloride under the influence of the chlorides of the alkalies, at the temperature of the human body.

The conclusions announced by this Italian Chemist have been entirely corroborated by the repeated observations I have made on the same subject. The following are the results of my experiments:—

1st. Protochloride of mercury, perfectly free from perchloride, and mixed with an equal weight of hydrochlorate of ammonia, or of a chloride of an alkali, digested in distilled water at a temperature of from 100° to 104° Fahr., during twenty-four, thirty-six, and even forty-eight hours, does not change colour. The liquor, when filtered, has never indicated, by any reaction, the presence of even a trace of a mercurial salt.

Pigeons that were made to drink this liquor during several days in succession, suffered no injury. There appeared to be no diminution in the original weight of the calomel.

2d. The same mixture, exposed to a temperature from 120° to 140° Fahr., afforded a liquid which comported itself with re-agents, and in its action on the animal economy, precisely the same as the last mentioned.

3d. Nevertheless, by continued boiling, and under the influence of a large excess of chlorine, the transformation does take place; but it is even then only partial.—*Journal de Chimie Médicale.*

Chemical Manipulation. By Michael Faraday, D.C.L., F.R.S., F.G.S., M.R.I. Third Edition. 8vo, pp. 664. 18*s*. *John Murray, Albemarle Street.*

This work is printed, and will shortly be published. We are sorry to find, on inquiry, that the number of copies printed is not sufficient to supply the Society, and therefore, advise our

readers to lose no time in bespeaking the work. Copies of the second edition have lately been sold at a premium of above fifty per cent. In our next number we intend to review the forthcoming edition, of which we have received a copy.

BOOKS RECEIVED.

AN INTRODUCTION TO CHEMISTRY. By GEORGE SPARKES, 12mo, pp. 88. *Whittaker and Co., Ave Maria Lane.*

This homœopathic dose of Chemical Science is intended for beginners, and contains just enough information to create a desire for more. The experiments which are described are such as may be performed without "difficulty," "danger," or "expense;" and the several subjects introduced, are treated of as much in detail, and elucidated with as much precision as could be expected for half-a-crown.

REPORT OF RESULTS OBTAINED BY THE USE OF THE MICROSCOPE IN THE STUDY OF HUMAN ANATOMY AND PHYSIOLOGY. By JAMES PAGET, Demonstrator of Anatomy at St. Bartholomew's Hospital, &c. 8vo, pp. 51. 2*s.* 6*d.* *J. Churchill, Princes Street.*

The subject of this Report is so interesting, and the topics comprised in it so numerous, that an attempt to give an analysis of it would carry us beyond the limits which our space allows. We must, therefore, be content to recommend it to the notice of our readers.

FOOD *and its Influence on* HEALTH AND DISEASE, *or an Account of the Effects of different kinds of Aliment on the Human Body, with* DIETETIC RULES FOR THE PRESERVATION OF THE HEALTH. By MATTHEW FREEMAN, M.D., &c. &c. 8vo, pp. 240. *London: John Murray, Albemarle Street.*

An Essay on the Chemical, Botanical, Physical, and Parturient Properties of SECALE CORNUTUM, *with an Engraving.* By T. H. WARDLEWORTH, *Surgeon.* 12mo, pp. 69. *London: Simpkin, Marshall, and Co. Manchester: Bancks and Co. Rochdale: Wrigley.*

A PAMPHLET *on the Diseases which affect corresponding Parts of the Body, in a symmetrical manner.* By WILLIAM BUDD, M.D., Bristol. 8vo, pp. 69, with plates. From Vol. XXV. of the Medico-Chirurgical Transactions. *London: Richard Kinder, Green Arbour Court, Old Bailey.*

TO CORRESPONDENTS.

A FEW errors in the List of Members and Associates have been discovered ; we defer the publication of the list of errata until next month, in order to ensure its being complete.

We have received a communication to which we should have replied by post, but the name and address are quite illegible, although the letter itself is distinctly written.

"BROTHER EDITOR"—We have apologised to Professor Graham for our error respecting Lanthanium. We find that element is described in Professor Graham's work, but it is omitted in the index, which occasioned the mistake

T. M. C. A. P. S.—The day of the examination is the third Tuesday in each month. Notice must be given by the candidates before the first of the month. The other questions are answered in the Journal, Vol. ii. No. ii. (the leading article) and in several other places.

We take this opportunity of referring all our Correspondents (Members and Associates) to the notices inside the cover, at the beginning of each number, which contain answers to many inquiries constantly made with reference to lectures, meetings, examinations, the distribution of the Journal, and other official matters.

"ALPHA"—As the constitution of the Society provides that it shall consist of Chemists and Druggists, the Council have no alternative but to return the subscriptions of any persons not coming under this denomination, who may have been by accident illegally admitted. We have made inquiry respecting the case to which "Alpha" has called our attention, and the subject will be discussed at the next meeting of the Council.

"AMATOR DOCTRINÆ."—The decoction should be strained before it is cold, and allowed to stand for a short time, when the deposit takes place and the clear liquor may be poured off.

G. N.—The Excise laws are applicable to spirit for whatever purpose it is used ; and a Chemist who evades the duty, by distilling spirit from the grain to use in his business, is of course liable to the penalty. If G. N. will favour us with his name and address we shall be happy to answer his other question.

T. G. C. has sent us a formula for Linimentum Hydragyri Nitratis. Having published one form, we think it better not to create confusion by adding another.

"AN IRISHMAN" has sent us a formula for *Infusum Secale Cornuti.* It consists of a drachm of the powder and three ounces of water, reduced by boiling to one-half. Dose : one-third every twenty minutes. It should have been termed a decoction. Our correspondent also gives a formula for the tincture, which, as well as the former, was published some years' ago by Dr. Blundell. To an ounce of Secale Cornutum and two ounces of boiling water, infused for twenty-four hours, add an ounce and half of rectified spirit. Macerate for ten days and strain. Dose : half a drachm.

B. T. A. P. S.—A Chemist is justified in making the preparations ordered in the Pharmacopœia by any process he may think proper to adopt, provided the result be in strength, properties, and composition, identical with that which is obtained by the Pharmacopœia process.

"A CORRESPONDENT."—We believe the purgative quality of castor oil is not impaired by the addition of carbonate of potash in the form of emulsion. If our correspondent will try the experiment *in propriâ personâ*, we shall be glad to publish the result for the benefit of science. We have not seen any published formula which we could recommend for marking ink which requires no preparation. All proprietory medicines, which are sold with printed directions, stating the complaints to which they are applicable, and the manner in which they are to be employed, require a stamp. It is generally believed that the process of percolation is the one which is most adapted for the preparation of concentrated infusions.

"FILIUS ESCULAPII" tells us, "Dr. Black asserts that nitrate of silver will preserve water," and inquires in what proportions it should be used. We have not seen the passage in Dr. Black's works, and cannot recommend the beverage.

Mr. JOHN PICKBOURN has found the following observation among some old memoranda: "In making Ung. Hyd. Nit. if a small portion of muriatic acid be added, it will always remain soft:" and thinks it *possible* that the salt contained in the lard of commerce might have a similar effect. This is offered as an explanatien of the "uncertainty in the product," and not with a view of recommending the addition. Mr. Pickbourn states, that he has in his possession medicated waters prepared with magnesia six years ago, which remain unaltered and unimpaired in their properties.

"AN ASSOCIATE" (Bristol).—Between the beginning of May and the end of September.

"AN ASSOCIATE" (London).—We consider Blaine's "Veterinary Art," price 1*l.* 1*s.*, the best work on the subject.

"J. H." (Nottingham) is referred to Mr. Dinneford.

Mr. JOHN EARLAND.—We conceive that the several formulæ of the three Colleges for the preparation of liquor potassæ are all efficient, although the specific gravities of the results differ. That of the London Pharmacopœia is 1.063, the Edinburgh 1.072, and the Dublin 1.080. Provided this circumstance be taken into consideration, we think it immaterial which process is adopted. The best tests for the purity of essence of lemon, are, its peculiar smell, its specific gravity (.847 at 70° F.), and its perfect solubility in anhydrous alcohol.

P. Z.—(1) The best means of obtaining wood ashes for Brandish's Solution of Potash, is to burn ash wood in a clean grate, and collect the ashes. (2) We were not aware of the fact that Sp. ammon., arom. condensed in a pewter worm, does not become turbid on the addition of water, but presume that a pewter worm is never employed in the process. (3) Fresh lemon peel is ordered in the Pharmacopœia.

MR. ALFRED BURGESS informs us that a nostrum was sold 14 or 15 years ago, under the name of "Ætherial Tincture of Lobelia Inflata," composed of equal quantities of a tincture of Pigtail Tobacco and Sulphuric Æther, with eight minims of Schcele's Hydrocyanic Acid to the ounce. (This information is given in reference to a question answered in our last number, page 218).

"AN ASSOCIATE." (Bolton).—An Associate of the PHARMACEUTICAL SOCIETY ought to be able to translate any passage in a Latin Pharmacopœia.

"AN EXPERIMENTALIST."—One of the best methods of reducing metallic zinc to powder, consists in pouring the fused metal into a cold iron mortar, and rubbing it briskly with the pestle, or it may be poured in the fused state into cold water.

"T. H. H. A.P.S." has given the following formula for Concentrated Camphor Julep :

℞ Tinct. Camphoræ Simp. P.L.
Aq. Destil. aa ʒij.
Sp. Rectif. ʒv. M.

The nature of the deposit which takes place in some tinctures, after they have been kept a long time, is not well understood.

"Romulus."—We recommend Mr. Parnell's work on Chemical Analysis, recently published by Taylor and Walton, price 10*s.* 6*d.*

"Δ Socius."—Oxymel Scillæ should be sent out bright. The scum which frequently rises to the surface and collects about the upper part of the bottle, should be removed by heating and straining the Oxymel.

H. Chalmers, M.P.S., is referred to Vol. II. No. II. page 88.

"A well-wisher to the Pharmaceutical Society."—The limits of the Journal would not admit of the publication of the courses of lectures delivered at Bloomsbury Square. It is possible that some of them may, at a future time, be published separately. The use of symbols is a great convenience in the study of Chemistry, and a knowledge of them, which is necessary to those who read modern works on Chemistry, is easily acquired. We cannot publish a list of the London retail prices. It would be a curious and voluminous document.

H. M., A. P. S. proposes a course of evening lectures at eight o'clock, for the benefit of the Assistants of wholesale houses, who cannot attend in the morning. The subject will meet with due consideration.

P. S.—The subscription is due on the 1st of January.

"Medicus."—We can imagine the case of an Apprentice of a Surgeon-Apothecary who may be considered qualified for admission as an Associate of the Pharmaceutical Society ; but when he "professes to act as a visiting Apothecary or Surgeon," he is no longer eligible.

Mr. Whitmore advocates the closing of shops in London at nine o'clock instead of eleven, and enlarges upon the hardships of constant imprisonment for twelve or fifteen hours a-day in "the narrow space between the counter and the drawers." "A Faithful Member" and "An Associate" have also written to us on the same subject. We can only repeat that we should be glad to unite with our brethren in any *practicable* plan for diminishing this evil. We have already explained our views of the difficulties of the case in No. V. page 219—222, and intend to offer a few remarks on the subject in our next number.

"Medicus" (Whitehaven) enquires, whether a person, who carries on business by means of an Assistant, being entirely ignorant of it himself, would be admitted as a member ? — We ask, is it likely that such a person would be able to pass the examination ? "Medicus" also enquires, whether the Apprentice of a Member would be admitted as an Associate ? — This question is answered in Vol. II., No. II., page 58—line 3 to 6.

Advertisements to be addressed to Mr. Churchill, 46, Princes Street, Soho.

Other Communications to the Editor, 338, Oxford Street (before the 20th of the month, if answers be desired in the ensuing number).

PHARMACEUTICAL JOURNAL.

VOL. II.—No. VI.—DECEMBER 1st, 1842.

PHARMACEUTICAL NOMENCLATURE.

The practice of designating substances according to their known or supposed constitution, is now generally adopted by scientific Chemists, and this system possesses the advantage of presenting to the mind a more definite idea of the nature of various bodies, than could be conveyed by an arbitrary nomenclature. The discoveries which are almost daily progressing, give rise of necessity to continual changes in the terms employed, and in some cases occasion a degree of confusion which is perplexing to the student. This, however, is of secondary importance to those who study the subject merely as a science, since an intimate acquaintance with all these details is absolutely necessary to those who prosecute such researches, and consequently, the use of the new names tends rather to assist the memory, by associating with each substance the facts with which the mind is already supposed to be familiar.

But in Pharmacy the case is altogether different. The object of this pursuit is the adaptation of chemical science to the alleviation or cure of disease, and other considerations present themselves which preclude the possibility of a rigid adherence to the progressive changes alluded to, without endangering life. An error on the part of the philosopher may occasion the failure of his experiment, but the substitution of one substance for another by the Pharmaceutical Chemist may produce much more serious consequences. For this reason, although an ambiguity of terms, during the transition from one system to another, may be tolerated in the one case, absolute perspicuity should be the primary consideration in the other. The author of a work on Chemistry would sacrifice his reputation by adopting terms founded on exploded theories, and it has been urged that the authors of a Pharmacopœia should keep pace with the progress of science. But it must be recollected that the Pharmacopœia is not professedly a treatise on Chemistry, but a medium of communication between the prescriber and the dispenser of medicine: in cases, therefore, in which the adoption of modern theories is likely to create ambiguity, the primary object of the

work should not be overlooked in the vain endeavour to realize an Utopian system of perfection, which, even if attained, could have but an ephemeral existence.

The Pharmacopœia being a code of laws promulgated by one class of persons for the guidance of another class, with whom the former have little, if any, personal intercourse, it is evident, that whenever a revolution in chemical theories takes place, unless both parties act upon it simultaneously, much inconvenience and, in some cases, danger must inevitably result, especially where *old terms* are retained with *new significations*. Within the last thirty years, the theories relating to some of our most important remedies, have undergone more than one entire subversion, and the nomenclature of the Pharmacopœia of 1836, is already in some particulars at variance with the state of chemical science in 1842.

Medical men are too much occupied with their own responsible duties to devote much time to the study of Chemistry, and thus to become familiar with every discovery immediately on its development; and in our own experience we can testify, that each successive edition of the Pharmacopœia is not universally adopted by the profession by the time a new one appears.

This circumstance should always be taken into consideration, and it should also be a rule in the selection of terms to adopt such as are sufficiently dissimilar from each other, so that the life of a patient, or the accuracy of a prescription, may not be dependent on the omission or insertion of a single letter. Those who are in the habit of reading prescriptions are well aware of the liabilities to error from the accidental resemblance of words, as they appear when written with the contractions usually employed.

The following are a few instances in which the resemblance of the words placed opposite to each other in the first and second columns, sometimes occasions a doubt as to which substance was intended, which could not exist if the articles in column 2 were designated as in column 3.

Acid. Hydroc(y).	*Acid. Hydroc(hl).*	*Acid. Muriat.*
Ol. Menth. p(ip).	*Ol. Menth. P(ul).*	*Ol. Pulegii.*
Tinct. Camphor. (C.)	*Tinct. Camphor.*	*Sp. Camph.*
Lin. Camphor. (C.)	*Lin. Camphor.*	*Oleum. Camphoratum.*
Liq. Potas.	*Liq. Pot. (ars.)*	*Liq. Arsenicalis.*
Pil. Rhei. co. (P. L.)	*Pil. Rhei. co. (P. E.)*	*Pil. Rhei. c. Aloe.*
Acid. Hydrocy. (Scheele.)	*Acid. Hydrocy. (P. L.)*	*Acid. Prussic.*
Pulv. Ipecac. co.	*Pil. Ipecac. co.*	*Pil. Ammoniaci, co.*
Calx Chlor(inata).	*Calcii Chlor.*	*Calcis. Murias.*
Soda Chlor(inata).	*Sodii Chlor.*	*Sodæ Murias.*
Pulv. Antim. (t.) or *(p. t.)*	*Pulv. Antim. (C.)*	*Pulv. Antimonialis.*
Tinct. Opii.	*Tinct. Opii (C.)*	*Tinct, Camph. co.*

The liability to mistake is not so evident when the words are in print; but when written in haste or with a bad pen, it is sufficiently obvious. In citing these cases, our object is merely to illustrate a principle, not to advocate any particular terms; and the remarks which we have made on the subject are founded on experience and observation.

When recent chemical discoveries have demonstrated the inaccuracy of any terms employed in Pharmacy, it would be better to retain the nomenclature which is generally understood, and insert a list of synonymes in a note, than to create confusion and endanger life by an adherence to the most modern system.

In the practical operations of Pharmacy, the most important consideration is the administration of the right substance, not the adoption of the most scientific name, and for this reason the names employed should rather have reference to the known and obvious characters of the substances than to their supposed constitution. Dr. Pereira* observes, on this subject,

"The Latin nomenclature of the articles of the Materia Medica is of two kinds, *classical* and *scientific*. Scientific names represent opinions rather than facts, and hence require to be altered according to the fashion of the day." "We have only to look at the writings of some of the ablest chemical philosophers of the present day, to see the germs of still greater and more important changes in nomenclature than any that have yet been made."

Dr. Paris† expresses a similar opinion, which is as follows:—

"I am disposed to consider it a matter of regret that the names of our medicinal compounds should have any relation to their chemical composition; for in the present unsettled state of this science, such a language must necessarily convey theory instead of truth, and opinions rather than facts."

After enumerating a few instances of recent changes incidental upon the progress of science, Dr. Paris observes,

"It is far from my intention to question the propriety of these changes, I only maintain that, amidst such chemical doubts, the Pharmaceutist is the last person who should become arbiter; let him await the issue in unobtrusive silence, and take care that the language of Pharmacy partakes of the same neutrality."

This opinion of Dr. Paris was published in the year 1825; but in the preface to the Pharmacopœia of 1836, we find the following observation:

"In the present day it is scarcely necessary to discuss the change fnames: for although all admit that it ought not to be done inconsiderately, yet it was to be feared, lest the avoidance of the error, likely to arise from the change, would lead to a greater one. We are persuaded that the name which the most eminent professors of the science have bestowed upon a substance will eventually be the most certain and permanent. We have, therefore, determined

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* Selecta e Prescriptis. P. 76.

† Pharmacologia. Sixth edition. P. 73.

to follow in their footsteps, and put up for a short time with inconvenience, if any should arise, or learn to speak barbarously, rather than incur the danger of becoming obscure from employing a doubtful or ill-defined expression."

In the royal proclamation, by which the observance of the Pharmacopœia is enforced on all Apothecaries and compounders of medicine, it is premised, that the said book "will contribute to the public good of his Majesty's subjects, by preventing all deceipts, differences, and uncertainties in making or compounding medicines.....wherein the lives and health of his Majesty's subjects are so highly concerned," &c.

These quotations, coming from the highest authority, amply confirm the position with which we set out, namely, that in pharmaceutical nomenclature, *absolute perspicuity* is the primary consideration. Since all parties concur in this opinion, it is to be regretted that the means adopted for the attainment of this end are calculated, as experience has shown, to lead to an opposite result. A few instances will be sufficient to prove that this assertion is correct.

The following are the synonymes of

CALOMEL.	AND CORROSIVE SUBLIMATE.
Aquilla Alba	Mercurius corrosivus albus
P. L. 1720, Calomelas . . .	Mercurius corrosivus sublimatus
1745, Mercurius dulcis sublimatus	Ditto
1787, Hydrargyrus muriatus mitis	Hydrargyrus muriatus
1815, Hydrargyri submurias .	Hydrargyri oxymurias
1836, Hydrargyri chloridum .	Hydrargyri bichloridum

In this instance the syllable "bi-" now constitutes the only distinction between these two substances; one of which is a deadly poison, when administered to the extent of a grain or two; the other is a medicine hourly in use, and frequently prescribed in doses of four or five grains.

The distinction between hydrargyri *submurias* and hydrargyri *oxymurias* (of 1815) was more definite, but the theory on which this nomenclature was founded is incorrect, for which reason the names were changed. How far this change has had the desired effect will be seen by reference to recent works on Chemistry.

Dr. Kane and Dr. Thomson, of Glasgow, among the salts of mercury, describe "chloride of mercury" as "corrosive sublimate, Hg. Cl;" "sub-chloride of mercury" as "calomel, Hg_2 Cl."

Professor Graham also adopts this nomenclature, which is founded on the presumption, that the equivalent number of mer-

cury is about 101, which number has been adopted by some of the most eminent Chemists of the day, while it was formerly estimated at double that number, or 202, the number recognised by the compilers of the Pharmacopœia.

Considering 101.43, then, as the lowest combining proportion of mercury, the red oxide will be a protoxide, in the sense in which that term is generally used, that is, a combination of one equivalent of each element; and the black oxide will be a suboxide. It is evident also, that a similar change will follow in the nomenclature of all the other mercurial compounds.

The *oxide of mercury* of the Pharmacopœia of 1836, equiv. 210, symbol Hg O, is called by Professor Graham, Dr. Kane, and some other Chemists, the *suboxide* of mercury, or *black oxide*, eq. 210, Hg_2 O.

P. L. 1836.		New System.
Binoxide of Mercury, eq. 218. Hg O_2	} = {	*Protoxide of Mercury*, eq. 109.4. Hg. O
Iodide of Mercury, eq. 328. Hg I	] = [	*Sub-iodide of Mercury*, or *Yellow Iodide* Hg_2 I
Biniodide of Mercury, eq. 454. Hg I_2	] = [	*Iodide of Mercury—Red Iodide*, eq. 228. Hg I
Bicyanide of Mercury, eq. 254. Hg Cy_2	} = {	*Cyanide of Mercury*, eq. 127.87. Hg Cy
Bisulphuret of Mercury, eq. 234. Hg S_2 &c.	} = {	*Sulphuret of Mercury*, eq. 117.55. Hg S, &c.

It is unnecessary to enumerate the other salts of mercury, but we have placed in juxtaposition the conflicting authorities respecting those compounds which are most important from their frequent employment, and the serious consequences likely to result from the accidental substitution of one for another.

The perplexity occasioned by the alteration in the nomenclature of the carbonates of soda and potash, has been found by experience to be a serious evil. In this case, however, no *danger* is likely to result, as the substances are so nearly allied in their medicinal effects, that the substitution of one for another could not prove fatal.

Many other instances might be mentioned in which an observance of the theories which are daily springing up would involve the Pharmaceutical Chemist in confusion. We need only advert to the following, as exemplifications of the revolution which appears to be in progress:

Old Names.	Suggested Nomenclature.	
Oil of Vitriol .	*Sulphatoxide of Hydrogen* or *Oxysulphion of Hydrogen*	Graham. / Daniell.
Nitre, or *Nitrate of Potash* . .	*Nitratoxide of Potassium* or *Oxynitrion of Potassium*	Graham. / Daniell.
Ether . . .	*Oxide of Ethule* . .	Liebig.
Alcohol . . .	*Hydrate of Oxide of Ethule* .	Liebig.
Ammonia . .	*Amidide of Hydrogen* . .	Dr. Kane.
Sal Ammoniac, or *Muriate of Ammonia* . . .	*Chloro-Amidide of Hydrogen*	Dr. Kane.
White Precipitate of Mercury, or *Ammonio-Chloride of Mercury*	*Chloro-Amidide of Mercury.*	Dr. Kane.

We have thus endeavoured to prove that the mutability of scientific nomenclature far exceeds that of a nomenclature altogether arbitrary or conventional. Calomel has been calomel ever since the year 1655, and it will be calomel *ad infinitum*. The red oxide of mercury will retain its characteristic tint, and can never be mistaken for the black oxide, nor can any confusion or doubt exist between the red iodide and the yellow. But chloride of mercury is a term dependent upon the caprice of fashion, and at the mercy of any new theory which may be started. The term *binoxide* is equally liable to variation in its meaning; and if we continue to follow the fashions of the day in our Pharmacopœia, it will be necessary for the dispensing Chemist, whenever any of these substances are ordered in a prescription, to call on the prescriber and inquire whether he is a follower of the old school or the new.

In a former number (vol. 1, page 454), the inconvenience which we have already experienced from alterations in names and formulæ, is alluded to; our remarks on the present occasion have reference more particularly to prospective evils, which may be avoided by a deviation from the system at present in force, and an observance of the principles which ought to regulate Pharmaceutical nomenclature. The daily experience of the dispensing Chemist brings forcibly to his mind the importance of an attention to the facts which have been stated, and which are likely, in some instances, to escape the notice of those who are not practically conversant with the doubts and perplexity resulting from ambiguous terms in prescriptions.

TRANSACTIONS
OF
THE PHARMACEUTICAL SOCIETY.

LECTURE
ON HEAT.

DELIVERED AT THE ESTABLISHMENT OF THE PHARMACEUTICAL SOCIETY, OCTOBER 26th, 1842,

BY MR. THEOPHILUS REDWOOD.

Heat, or caloric, is at once the most universal in its extension, and the most energetic in its operations, of any of those natural agents by which the condition and constitution of bodies are modified. It is to this agent that we are accustomed to trace the effects of the seasons, its influence expanding the latent vitality, and giving a new birth to vegetation. Nor is it less influential in regard to animal than it is to vegetable life. In the great laboratory of Nature, it appears to act a prominent part in all the changes which are effected in matter. Hence it is that the Chemist, who is in some respects an imitator of nature, has frequent occasion for the application of heat, in operating upon bodies; and it constitutes, in his hands, a powerful and wonder-working agent. Again, in the operations of Pharmacy, which is a branch of Chemistry, heat is constantly employed, to modify the chemical action of bodies upon each other, or to alter the condition or state of aggregation of substances, so as to facilitate admixture and separation. The Pharmaceutical laboratory, in fact, is little else than a provision of contrivances for the production and application of heat; and the successful operator there must not only possess these requisite means, but should also be well acquainted with the principles upon which their application is founded. I propose, therefore, in this lecture, to direct your attention to the subject of heat, considered as an agent in Pharmaceutical operations.

Of the nature of heat we know nothing: we are acquainted only with its effects; and these effects are manifested in all bodies of which we have any knowledge. Heat exists in bodies in two conditions, as *sensible* and as *insensible* heat. Sensible heat is also termed *free caloric*, or *caloric of temperature*. It is the variation in the degrees of sensible heat that gives rise to the feelings of heat and cold. It is this part only of the heat of

a body that can be appreciated by the thermometer, or communicated from one body to another.

But heat exists in bodies in an insensible state. Thus latent heat is insensible heat; and indeed the term *latent heat* is not unfrequently used to designate insensible heat under all circumstances. This, however, is not a correct use of the term *latent heat.* Insensible heat is not necessarily latent heat. Thus, if we rub two pieces of dry wood together, they become heated, their temperature is raised; that is, a portion of heat which before was insensible in the wood, becomes sensible, and capable of being communicated to other bodies; but the heat which is thus liberated, cannot be called the latent heat of the wood. Latent heat is the term which is applied to designate the heat which is absorbed by bodies when they undergo a change of aggregation from the solid to the liquid, or from the liquid to the gaseous state. Thus, the heat which is required to convert ice, at a temperature of 32°, into water of the same temperature, is the latent heat of water; and that which is required to convert water into steam is the latent heat of steam. Now, in these cases—in the melting of ice, and the boiling of water—a great quantity of heat is communicated to the ice and to the water, without its being rendered in any degree sensible.

Under ordinary circumstances, however, on applying heat to a solid, a liquid, or a gaseous body, the sensible heat of the body is increased—its temperature is raised; but the same quantities of heat do not produce equal changes in different bodies. Thus, a pound of water and a pound of alcohol, require respectively a very different amount of heat to raise them from 32° to 100° of temperature. The term *specific heat* is used, in this case, to designate the heat required to raise the temperature any given number of thermometrical degrees.

We have no means, however, of determining the whole amount of heat contained in a body, for no substance has ever, that we know of, been deprived entirely of its heat. We can only estimate the specific heat of bodies, therefore, by comparison, and in this comparison water is generally taken as the standard.

These, then, are the terms which are used to describe the different conditions under which heat exists in bodies. It exists as sensible and as insensible heat; and the sum of these—of the sensible and insensible heat—is the specific heat of a body. Latent heat again, is the heat of liquefaction and of vaporization.

But whatever be the condition in which heat exists in bodies, there is only one state in which it can be communicated to them or from them, and that is, in the state of free or sensible heat.

Free caloric, or sensible heat, is derived from several sources: from the sun—from chemical action—from mechanical action—

from electricity. We obtain the supply of heat required in our operations from a species of chemical action, called *combustion*. Heat is set free during combustion, and is communicated to surrounding bodies. The combustion of carbon, in some shape or other, is generally our source of heat. Thus, one ounce of carbon during combustion (that is, in combining with oxygen to form carbonic acid), gives out as much heat as would raise an ounce of water from 32° to 14239° of temperature, or seventy-eight ounces of water from the freezing to the boiling point.

It is of great importance to the Pharmaceutical Chemist to be able to generate heat of that degree of intensity, and in that quantity which he requires, and when generated to be able to apply it economically. The furnace is the apparatus we employ for the production of heat; and a good set of furnaces is no less essential in the laboratory than good scales and measures are in the shop. There are three kinds of furnace which are employed in our laboratories, namely, the common *ring furnace*, for placing a pan or small still over; the *reverberatory furnace;* and the *wind furnace*. The ring furnace, which is well known to you all, is adapted only for the application of heat to the bottom and sides of a vessel. The reverberatory furnace differs from this, in having a dome or reverberating roof, by which the heat is thrown on to the top as well as other parts of the body placed in it. The wind furnace is intended for the production of an intense heat, such as could not be obtained with either of the others. It is generally constructed without any furnace-door, the fuel being supplied by an opening at the top, and the ash-pit has a small opening through which a strong current of air is forced by a bellows, or other means. The wind furnace is, in fact, a blow-pipe on a large scale.

But now, having obtained our heat, how are we to communicate it to the bodies upon which we wish to operate? There are two ways by which heat is communicated from one place to another—by conduction and by radiation. Heat is communicated by conduction through solid bodies, and by radiation through air. If one end of an iron rod be heated, the heat is communicated from particle to particle through the metal, until it reaches the other end. This is called the *conduction of heat.* If now this heated metal be held in the neighbourhood of another body, without their being connected by any conducting medium, the heat will be emitted from the surface of the heated body, and passing through the air, will be communicated to the other body. The same would be the case if the intermediate space were vacuous. This is called the *radiation of heat.*

Again: if we take a rod of iron and a rod of glass, and apply heat equally to one end of each, the heat would be conducted much more readily through the iron than it would through the glass.

We say, therefore, that iron is a better conductor of heat than glass. It is important, in the application of our subject, to be aware of the relative conducting powers of different bodies. The metals generally are good conductors of heat, and of these gold is the best. Copper also is a good conductor of heat, its conducting power being more than double that of iron. Hence the advantage of constructing those vessels of copper which are intended to be used in operations where a rapid supply of heat is required. Evaporation, for instance, can be carried on much more rapidly in copper than in iron vessels, other circumstances being equal. On the other hand, earthenware, glass, and wood, are bad conductors of heat.

There is, then, a great difference in the power which different bodies possess of conducting heat. The same is also found to be the case with regard to the radiation of heat; but those bodies, generally, which are the best conductors, are the worst radiators of heat. Glass, which is a bad conductor, is a good radiator, whilst clean polished metals, which are good conductors, are at the same time bad radiators. Thus, a liquid will retain its heat much longer in a metallic vessel, having a smooth bright surface, than it would in a glass vessel, or even in the same metallic vessel, if the surface were covered with lamp-black, or any good radiating substance. This may be illustrated by pouring hot water into two tin vessels of equal capacity, one of which has a bright metallic surface, and the other is coated over with lamp-black, and observing, by means of an air thermometer introduced into each vessel, the time they respectively take in cooling. It will be found that the temperature of the water in the vessel coated with lamp-black will fall more rapidly than that of the other, and this takes place, notwithstanding the fact, that in the case of the coated vessel, the heat has to pass through a thicker medium, one part of which, namely, the lamp-black, is a bad conductor of heat.

But there are other circumstances, besides the conducting and the radiating powers of bodies, which influence the communication of heat from one body to another. In the communication of heat by radiation, we have to consider not only the radiating power of the body giving out the heat, but also the absorbing power of the body receiving or taking it in. Now, it is found that bodies are good absorbers of heat, in proportion as they are good radiators. Bad conductors of heat, then, are generally good radiators and good absorbers, and the metals, especially when smooth and polished, are bad radiators and bad absorbers. In proportion, also, as a body is a bad absorber, it necessarily follows that it must be a good reflector of heat. The radiant heat which inpinges upon a body, must be either absorbed or reflected, and thus we find that the reflecting power of substances is repre-

sented as being in an inverse ratio to their radiating and absorbing powers.

In accordance with these principles, it will be readily perceived, that if heat is to be communicated to any substance contained in a vessel, as for instance, in heating water over a lamp, it is important to consider, first, the conducting power of the material of which the vessel is composed; and secondly, the absorbing power of the surface of such vessel. A bright metallic vessel, from the circumstance of the metal being a good conductor of heat, may be thought to afford the means of heating any liquid contained in it very easily, when held over a lamp; yet this is really not the case, for polished metal being a good reflector, the greater part of the heat is thrown back upon the lamp—it is not absorbed by the surface of the metal, and therefore cannot be conducted to the fluid contained within. But now, if the surface of this vessel be covered with soot, or in other words with lamp-black, the effect will be very different; the heat is now freely absorbed, and being once absorbed by the surface, it is rapidly conducted and communicated to the liquid within. We see, then, why it is, that a bright tea-kettle is not the best for boiling water quickly, although it is the best for retaining the heat, when once the water has been raised to the boiling-point. The kitchen tea-kettle, therefore, may be as black as you please, at least that part which is exposed to the action of the fire, but the parlour kettle, in which the boiling water is kept for use, should be perfectly clean and bright.

I have hitherto alluded only to the communication of heat through solid and gaseous bodies; in the case of liquids, other phenomena are presented. Heat is communicated through liquids, not by radiation, nor, generally speaking, by conduction, but by what is termed *convection;* that is, the heated particles of the liquid are expanded, and become specifically lighter than those, less heated, by which they are surrounded; they therefore rise to the surface, and their place is supplied by other colder and heavier particles. Thus a current is established, and the heated particles of the liquid become, as it were, the carriers of the heat.

Such, then, are the means by which heat is communicated from one body or place to another. Let us now consider what are the effects of heat upon bodies, when thus communicated. The most general and characteristic effect of heat is expansion. All bodies become expanded when their temperature is raised, in the same manner as a sponge, when wetted, expands, and occupies a larger space than it previously did. On the application of heat, the particles of a body are separated to a greater distance from each other, the consequence of which is, that the attraction which exists between these particles becomes weaker, and hence decom-

positions and new combinations often take place more easily at a high than at a low temperature. There is, however, as is well known, an exception to the general law of the expansion of bodies with the increase of their temperature, in the case of water. On applying heat to water, at a temperature of 32°, instead of expanding, the water contracts, and becomes specifically heavier, until the temperature rises to about 40°, at which the density of the water is greatest, and from this point it expands with every increase of heat. But expansion is not the only effect produced upon bodies by the application of heat; they suffer a change of aggregation, from the solid to the liquid, from the liquid to the gaseous state; and the phenomena connected with these changes offer the most important considerations in our application of the subject. Liquefaction and vaporization are processes of every day occurrence with the Pharmaceutical Chemist, and these processes can never occur without the agency of heat. It is by means of heat alone that bodies are retained in the liquid or the gaseous state. Thus, water is a combination of ice and caloric, and steam a combination of water and caloric.

Heat, then, is required to liquefy solid substances, and to vaporize liquids. These are the purposes for which we generally employ heat in our operations. It is, in most cases, either to effect liquefaction or vaporization. Now, I have already said, that latent heat is the heat of liquefaction and of vaporization. It is that portion of heat which is absorbed during the transition of a body from one state of aggregation to another. Thus, if we mix together a pound of ice, at a temperature of 32°, and a pound of water, at a temperature of 172°, the heat of the water is absorbed by the ice in its transition into the liquid state, and the product will be two pounds of water no hotter than the ice originally was; so that a quantity of heat, which would raise an equal weight of water through 140° of temperature, is absorbed, becomes insensible or latent, in the transition from the solid to the liquid state. The latent heat of water, therefore, is said to be equal to 140°. A striking illustration of the absorption of heat during liquefaction, is afforded in the solution of some salts, and in the use of what are called freezing or cooling mixtures. The effect in these cases arises from the conversion of sensible heat into latent heat during the liquefaction of the salt. Hence, easy solubility is an essential quality in the salts employed for this purpose. You have also, no doubt, many of you, observed, in dissolving spermaceti or wax in oil by means of heat, how very slowly the solution takes place. This arises from the large quantity of heat which is absorbed and rendered latent during the liquefaction of these substances. Thus, spermaceti, after being raised to the melting-point, absorbs as much heat in melting as would raise the same quantity of melted

spermaceti 145°. With wax the heat thus absorbed in melting is equal to 175°.

These are the latent heats of these substances, or, in other words, the quantities of heat required to retain them in the liquid state.

But now, if one of these, if water, for instance, be vaporized, a still further absorption of heat takes place, and this is called the latent heat of steam. Water can no more be converted into steam without the absorption of its due amount of latent heat, than ice can into water. There is, however, this marked distinction between the liquefaction of ice and the vaporization of water; the melting-point of ice, and the latent heat of water, are constant; ice always melts at 32°, and the heat rendered latent and which remains latent in the water, is always equal to 140°, while, in the vaporization of water, the case is quite different: water evaporates at all temperatures, and the heat rendered latent during the vaporization, depends upon the temperature at which the vapour is formed. The atmosphere we breathe is constantly loaded with the vapour of water, which is formed even in the coldest weather. A temperature of 212° then is not necessary to convert water into vapour, although a temperature of 32° is always necessary to convert ice into water. But the quantity of water which can be vaporized at low temperatures is comparatively small, and the effect is produced through a property possessed by every gaseous body, of diffusing itself through a vacuous space, or a space occupied by any other gas. This species of vaporization, when it takes place in the open air, is called spontaneous evaporation. Its extent and rapidity depend upon the temperature of the air and of the liquid being vaporized, and upon the dryness of the air. Atmospheric air is capable of holding a certain quantity of aqueous vapour in solution, or in a state of diffusion, and the quantity thus held depends upon its temperature. The higher the temperature, the greater the quantity of aqueous vapour it is capable of holding.

Spontaneous evaporation, then, is effected through the medium of atmospheric air, and depends upon the tendency which one vapour has to diffuse itself throughout another vapour. Gaseous bodies differ, in this respect, from liquids and solids. Two liquid or solid substances may be kept in contact with each other, without any admixture taking place. But with gases, the case is different: whenever there is access between two gases, mixture speedily ensues, each gas diffusing itself through the space occupied by the other. This diffusion is effected with considerable force, so much so indeed, as to induce Dr. Dalton to consider one gas as a vacuum to another gas. The tendency to diffusion,

in gases, seems to exercise an inductive influence in promoting the evaporation of liquids at a temperature below their boiling-points.

When the air is entirely removed from the surface of a liquid, the process of evaporation is facilitated. It takes place more freely at a temperature below the boiling-point, into a vacuous space, because, with the air, the whole of the aqueous vapour it generally contains, has been removed; there is, therefore, no obstruction to diffusion. Ebullition also takes place at a much lower temperature *in vacuo*, the pressure of the atmosphere being removed. Hence the advantage in many cases of conducting evaporation *in vacuo*, a process which is peculiarly applicable to the preparation of extracts.

The air, then, acts mechanically in preventing evaporation; and chemically, through a property it possesses, in common with all other gases, in promoting evaporation. It has an attraction for a certain quantity of aqueous vapour, which it holds in a state of diffusion. This quantity, however, is limited, and beyond this point, the weight of the atmosphere, pressing upon the liquid, counteracts the elasticity of the heated particles, and keeps them in the liquid state; and this effect continues with water, until it reaches the temperature of 212°, at which point the elasticity of the vapour is capable of overcoming the pressure of the surrounding air. This is the boiling-point of water; it is that temperature at which the particles are endowed with a sufficient elastic force to overcome their power of cohesion and the pressure of the atmosphere.

Thus we see that the vaporization of water takes place to a certain extent at all temperatures, the extent depending, if the temperature be below 212°, upon the temperature and the dryness of the air. But the heat rendered latent during this evaporation differs according to the sensible heat of the vapour. The latent heat of steam at 212° is equal to 1000° of temperature; that is, if estimated in the same manner as in the melting of ice, we should find that heat equal to 1000° of temperature was absorbed. But when the vapour of water rises at a lower temperature than 212° the latent heat is greater; so that in fact, at whatever temperature the vapour rises, the sum of its sensible and latent heat is always the same. Thus,

Water evaporating at 32° has 1180° of latent heat
" 100 " 1112° "
" 212 " 1000° "
" 300 " 912° "

The sum of the sensible and latent heat of steam is always 1212°. It will now appear evident that in evaporating a liquid, exactly the same amount of heat is always required, whatever

the process may be. It matters not whether we evaporate by boiling under the pressure of the atmosphere, whether we adopt spontaneous evaporation, or whether we evaporate in a vacuum, in each case the heat required for the vaporization of a given quantity of liquid will be the same, and this quantity, for water, will be equal to 1212°, as the amount of sensible and latent heat.

The usual method of evaporating water is by boiling it under the pressure of the atmosphere. It is thus that our processes of evaporation and distillation are generally conducted. The steam, in these cases, is generated at a temperature of about 212°. This is the temperature at which water boils, when the barometer stands at thirty inches, and when the vessel containing the water is a metallic one. There are circumstances, however, besides the pressure of the atmosphere, which materially affect the boiling-point of fluids. Thus it is found, that if the vessel have a perfectly smooth bright surface on the inside, the liquid requires a higher temperature to induce ebullition, than it would if the surface were rough. Iron filings, iron nails, or other metallic substances having sharp points, are found to facilitate ebullition. But, besides this, there is a material and constant difference in the boiling-point of fluids, according to the material of which the vessel containing them is composed. The boiling-point of liquids is higher in glass than it is in metallic vessels; and with some liquids this difference is really extraordinary. Thus, the boiling-point of water in a glass vessel is two or three degrees above 212°, and if the glass be perfectly smooth and clean, ebullition will not take place until even a higher temperature than this be attained. Again: in the case of ether, it is found, that by the introduction of a few bits of dry wood, the ether may be made to boil at 20° lower temperature than it otherwise would; and even water, according to the recent investigations of M. Marcet, may be made to enter into ebullition in glass vessels at a temperature below 212°, by coating the inner surface of the vessel with sulphur or shellac.

In boiling water, whether it be for the purpose of evaporation, as in making extracts, or in the process of distillation, we require a very large supply of heat, in consequence of the great quantity absorbed as latent heat by the steam. This latent heat again becomes sensible on the condensation of the steam, and hence the necessity for the large supply of cold water required in the worm-tub or refrigerator.

This part of the subject involves so many points of detail, which are important and interesting to the practical Pharmaceutist, that their consideration must be deferred to some future occasion.

PHARMACEUTICAL MEETING,

NOVEMBER 9th, 1842.

MR. PAYNE, VICE-PRESIDENT, IN THE CHAIR.

ON THE CEYLON CARDAMOM.

BY JONATHAN PEREIRA, M.D., F.R.S. AND L.S.,

The Scitamineous plant which bears the fruit known in commerce as the *Wild* or *Ceylon Cardamom*, and which is the produce of the island whose name it bears, has not hitherto, at least to my knowledge, been described by any botanist.

The account given by Bontius* of a plant which he calls the *Cardamomum majus* does not constitute any exception to this statement. For, in the first place, it is by no means clear that the fruit which he has figured is identical with our Ceylon Cardamom; and even admitting that it is, he must have fallen into some remarkable error with respect to its mother-plant, which, he says, is taller than a man, and has a flower like a hyacinth; and he gives a figure of it which represents a plant with a large, terminal, simple raceme. Now, neither his description nor his figure applies to the Ceylon Cardamom plant.

The hot acrid seeds known at the present day, in this country, by the name of *Grains of Paradise*, are exclusively brought from the Western Coast of Africa, and are, in consequence, sometimes called *Guinea Grains*. The plant which yields them is said by Willdenow† to be a native of Ceylon, a statement which I shall presently prove to be erroneous.

The most recent writer on the Botany of Ceylon is Mr. Moon‡, formerly Superintendent of the Botanic Garden of that island. This botanist mentions seven species of *Alpinia*, which are indigenous to, or cultivated in Ceylon. They are *Alpinia Allughas*, *Galanga*, *nutans*, *sericea*, *calcarata*, *Cardamomum*, and *Granum Paradisi*. Of these, the two latter alone have any reference to the subject of this paper. His notices of them, excluding the Singhalese characters, are as follows:—

♃ Alpinia Cardamomum, *Roxb.* Amomum repens, *Willd.* Cardamom. Kardumungu, *Portug.* Rata-ensāl, *Singhalese.* Seeds esculent. *Roxb. Cor.* 3, t. 226. Kandy; cultivated. Rich mixed soil.

♃ Alpinia Granum paradisi. Amomum Granum Paradisi, *Willd.* Ensāl, *Singhalese.* Seeds esculent. *Rheed. Malab.* 11 t. 6. Kandy; cultivated. Rich mixed soil.

Moon's statement, that the Grain of Paradise plant was culti-

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* *Hist. Nat.*, p. 127.

† *Species Plantarum*, t. i., p. 9. Berolini, 1797.

‡ *A Catalogue of the Indigenous and Exotic Plants growing in Ceylon.* Colombo, 1824.

vated at Kandy, greatly surprised me, for I had previously ascertained that Grains of Paradise were not exported from Ceylon, and it appeared to me highly improbable that they should be wholly consumed in the island. Moreover, the omission of all notice of the plant yielding the Ceylon Cardamom (for it is well known that the *Alpinia Cardamomum* of Roxburgh is the Malabar Cardamom), appeared to me most remarkable, and I concluded that there was some error in the names of the plants above referred to. It occurred to me that possibly the *Alpinia Granum paradisi* of Moon might, perhaps, be the Ceylon Cardamom. This notion was somewhat supported by the statement of Hermann*, that "*Ensal*" (the native name of Moon's Alpinia Granum paradisi) was the Singhalese name of Cardamom. Moreover, Gærtner † has figured the Ceylon Cardamom as the fruit called, by both Hermann and Burmann,‡ Ensal. I may observe, however, that the latter part of Gærtner's statement is not correct; for Burmann distinctly says that Ensal is the "Cardamomum minus et vulgare" of Clusius,§ who has figured under this name the Small or Malabar Cardamom.

In order to test the accuracy of this notion, I referred to Rheede's figure, vol. ii., t. 6., quoted both by Linnæus‖ and Moon as the representation of the Grain of Paradise plant. But I was both disappointed and surprised to find that its fruit bore no resemblance either to the Ceylon Cardamom or to the capsule of the African grain of paradise. It followed, therefore, either that my suspicion was unfounded, or that the reference to Rheede's figure was erroneous.

When my former pupil, the late Mr. Frederick Saner, Assistant Surgeon in her Majesty's 61st regiment, was directed to proceed to Ceylon, I requested him to procure me specimens of the plants in question, with their accompanying fruits; and in order to establish their identity as completely as possible, I begged him to obtain specimens named by the Superintendent of the Botanical Garden in Ceylon. Unfortunately, however, before I had received any communication from him on the subject, he was prematurely cut off by dysentery; but some months afterwards his botanical collections and papers arrived in this country, and among them I found three species of *Alpinia* which had been supplied by Mr. Lear, the present Superintendent of the

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* *Musæum Zeylanicum*, p. 66. Ed. 2d. Lugd. Bat. 1726.

† *De fructibus et seminibus plantarum.*

‡ *Thesaurus Zeylanicus*, p. 54. Amstelæd. 1737.

§ *Aromat. Hist.*, lib. i., cap. 24.

‖ *Species Plantarum*. Ed. 2d. Holmiæ. In the first edition of the *Species Plantarum* Linnæus did not quote Rheede's figure.

Botanical Garden at Ceylon, whose letter, stating the names of the species, I have now before me.

The first species was marked "*Alpinia* (*Amomum*) *Cardamomum. The finest species or true Cardamom.*" This specimen was in fruit, and was therefore easily recognised to be the Malabar Cardamom (*Elettaria Cardamomum* of Maton).

The second species was marked "*Alpinia* (*Amomum*) *Granum paradisi. Grains of Paradise.*" This specimen was also in fruit, and proved to be the *Wild* or *Ceylon Cardamom;* thus establishing the correctness of my suspicion that Moon's Grain of Paradise and our Ceylon Cardamom were identical.

The third species was marked "*Alpinia* (*Amomum*) *calcarata. Cardamom only used medicinally.* With this I have nothing to do on the present occasion.

Linnæus, in his *Flora Zeylanica*, makes no mention of the Grain of Paradise plant (*Amomum Granum paradisi, Linn.*) In the first, second, and third editions of his *Species Plantarum*, published respectively in the years 1753, 1762, and 1764, he merely gives Madagascar and Guinea as the habitats of his Grain of Paradise plant; so that he is free from the error, fallen into by some of his successors, of regarding this plant as a native of Ceylon. The earliest edition of the *Species Plantarum*, in which Ceylon is given (erroneously) as a locality for the Amomum Granum paradisi, is that of Reichard, published at Frankfort in 1779.

But though guiltless of the error just referred to, Linnæus has committed some others with respect to this plant. His statement, that Madagascar is one of the native places of the Amomum Granum paradisi, is an error; for the Madagascar Amomum is a species distinct from that of Guinea, which exclusively yields the hot fiery seeds now sold as Grains of Paradise. Moreover, the reference to Rheede's figure of "*Elettari*," vol. ii., t. 6. of the *Hortus Malabaricus*, as the representation of the Grain of Paradise, is an error which Linnæus himself committed in the second edition of his *Species Plantarum*, published in 1762. I am ignorant of the circumstances which led him to make this mistake. It is remarkable, however, that in the same edition he also refers to the same plate of Rheede's work, as containing a representation of the small Cardamom plant (*Elettaria Cardamomum*, Maton). The latter reference, which is also made in the *Flora Zeylanica*, I believe to be correct.

Willdenow, in his edition of the *Species Plantarum*, the first volume of which appeared in 1797, adopts the errors of both Reichard and Linnæus.

Moon follows Linnæus in referring to Rheede's figure of *Elettari*, plate 6, for a representation of the Grain of Paradise. As the fruit represented by Rheede neither resembles the real or

Guinea Grain of Paradise, nor the Ceylon Cardamom, which Moon regards as Grain of Paradise, I am at a loss to understand how he could have committed so gross and inexcusable an error, unless, indeed, he had not a copy of the *Hortus Malabaricus* to refer to, and, therefore, quoted it at second-hand from Linnæus and Willdenow. Linnæus probably, when he quoted Rheede's figure, had never seen the fruit of the Grain of Paradise; while Moon, though familiar with the fruit of the Ceylon Cardamom, may not have had access to the *Hortus Malabaricus* when he quoted it. So dissimilar is the fruit in question to the figure quoted, that in no other way am I able to account for the errors just referred to.

The Cardamom plant mentioned by Linnæus, in his *Flora Zeylanica*, as "Amomum scapo bracteis alternis laxis caule breviore," may have been either the Malabar Cardamom (*Elettaria Cardamomum*, Maton) or the Ceylon Cardamom (*Elettaria major*, Smith). I am inclined to think, however, that it was the latter; for the plants were collected by Dr. Paul Hermann, who gives, in his *Musæum Zeylanicum*, *Ensal* as the Singhalese name of the Cardamom plant. Now, Moon states, that this is the native name for his Amomum Granum paradisi (*Elettaria major*, Smith). It follows, therefore, that the synonymes "Cardamomum minus" and "Elettaria," given by Linnæus, are erroneous.

I now proceed to give a botanical description of the plant which yields the Ceylon Cardamom, premising, however, that my specimen, from which this description is drawn, is in fruit, and does not possess any flowers. Notwithstanding this drawback to the establishment of its generic position, I have no doubt that it belongs to the genus *Elettaria*. Speaking of the fruits, Sir James Edward Smith* observes, "We are persuaded they must belong to the same genus as the Malabar Cardamom. They appear to have a similar panicled inflorescence, and the structure of the *fruit*, with its central *receptacle*, coriaceous striated valves, and angular rough or rugged *seeds*, are the same in this as in the last."—[*Elettaria Cardamomum.*] Messrs. T. F. L. Nees von Esenbeck and C. H. Ebermaier† also observe, that they are inclined to regard the mother-plant of the *Cardamomum longum officinarum* (which from their description is obviously our Ceylon Cardamom) to be either the Elettaria Cardamomum or a species closely allied to it. In confirmation of the opinion of these eminent botanists, I may refer to the rhizome, stem, and leaves, which, as well as the fruit relied on by Sir J. E. Smith, have considerable resemblance to the Elettaria Cardamom. I

* *Rees' Cyclopædia*, vol. xxxix. Art. *Elettaria.*

† *Handbuch der medicinisch-pharmaceutischen Botanik*, 1er. Theil, p. 253. Dusseldorf, 1830.

feel myself justified, therefore, in regarding the Ceylon Cardamom as a species of Elettaria, and in adopting the specific name assigned to it by the last-mentioned distinguished botanist.

Elettaria Major, *Smith, in Rees' Cyclopœdia*, vol. xxxix; Alpinia Granum Paradisi, *Moon; Catalogue of the Indigenous and Exotic Plants growing in Ceylon;* Zingiber Ensal *Gærtner De fructibus et seminibus plantarum*, t. 12, f. 5; Cardamomum majus vulgare *Clusius, Aromatum Histor.* lib. i; Ensal, *Singhalese.* Figured in Pereira's *Materia Medica*, vol. ii., p. 1033. 2d edit. 1842.

Rhizome, with numerous branching root-fibres.

Stem erect, smooth, enveloped by numerous leaf-sheaths.

Leaves sessile (or nearly so) on their sheaths, silky beneath, acuminate; the shorter ones lanceolate, the larger ones oblong-lanceolate or slightly obovate-lanceolate; breadth two to three inches, length not exceeding fifteen inches.

Leaf-sheaths about half the length of the leaves, with a roundish ligula.

Scape from the upper part of the rhizome, flexuose, jointed, nine inches long, branched; the branches alternate, one from each joint of the scape, suberect, half an inch long, supporting two or three pedicels of about three-tenths of an inch long.

Bracts solitary, sheathing, at each joint of the scape, withered, partial ones solitary, ovate, acute.

Flowers not present on my specimen. *Inflorescence* probably panicled. *Calyx* three-lobed.

Capsules lanceolate-oblong, acutely triangular, more or less curved, with flat and ribbed sides; length about $1\frac{1}{2}$ inches, breadth $\frac{1}{3}$ of an inch. At one extremity there is usually found the long cylindrical, permanent, 3-lobed calyx. Each branch of the scape supports one or two capsules. Pericarp, in the dried state, coriaceous, tough, brownish, or yellowish ash coloured, 3-celled.

Seeds angular, rugged, with a yellowish or red hue; odour fragrant, aromatic, peculiar; flavour aromatic, spicy, but not acrid and fiery, like that of the Malaguetta pepper.

Perennial. Native of Ceylon; cultivated at Kandy. Grows in shady situations in a rich mixed soil.

The dried capsules are imported into this country from Ceylon, and are known in commerce as *Wild* or *Ceylon Cardamoms.* They are of inferior value to the *Malabar Cardamoms* (*Elettaria Cardamomum*, Maton). Thus in the *Trade List* of the 15th March, 1842, the price of Ceylon Cardamoms is quoted at 1*s.* 0*d.* to 1*s.* 2*d.* per lb. in bond, while that of the Malabar Cardamoms is quoted at from 1*s.* 8*d.* to 2*s.* 6*d.* per lb.

Mastius* states, that 100 parts of the Ceylon Cardamoms consist of 71 parts of seeds, and 29 parts of pericarpial coats. By distillation the seeds yield an aromatic oil.

Bertolacci† observes, that "the cardamom of Ceylon, although held in estimation as an article of trade, is accounted greatly inferior to that which grows on the coast of Malabar, and is sold, I believe, at only one-third of the price of the former. That which the island exports is collected chiefly in the Candian territory. I am informed that pepper, coffee, and cardamoms were not indigenous plants of Ceylon, but have been introduced by the Dutch." But it is probable that the latter part of this statement applies to the Malabar Cardamom only, which, according to Moon, is called by the Singhalese *Rata-ensal*, that is *Foreign Cardamom*—while the Ceylon Cardamom is simply called *Ensal*, that is, Cardamom.

The quantity of Cardamoms exported from Ceylon from the year 1806 to 1813 inclusive, is, according to Bertolacci as follows.

	Candies.
In 1806	$4\frac{1}{2}$
1807	15
1808	7
1809	$4\frac{1}{2}$
1810	18
1811	$9\frac{1}{4}$
1812	$7\frac{5}{8}$
1813	$10\frac{4}{5}$

AVERAGE OF EIGHT YEARS ABOUT $9\frac{1}{2}$ PER ANNUM.

As the Malabar Cardamom is, according to Moon, also cultivated at Kandy, it is probable that it constitutes a part of the above exports. I have not been able to ascertain the quantities exported subsequently to the year 1813.

Percival‡ observes, that "Cardamoms grow in the South-east part of the island [Ceylon], particularly in the neighbourhood of Matura. The seeds in taste resemble our caraways, and are used for seasoning various dishes." Moon also states that the seeds are esculent.

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* *Grundriss der Pharmakognosie des Pflanzenreiches*, p. 264. Erlangen, 1832.

† *View of the Agricultural, Commercial, and Financial Interests of Ceylon*, p. 157. London, 1817.

‡ *Account of Ceylon; to which is added the Journal of an Embassy to the Court of Candy.* 4to. Lond. 1803.

A FEW REMARKS ON AROMA.

BY MR. JOHN MACKAY.

In the course of Chemical investigation, we are often surprised with the emission of odour, while we are unable to account for this peculiarity. An interchange of elements by the decomposition of two inodorous compounds, produces an effect powerfully fragrant and pungent.

In the whole range of substances with which we are acquainted, there is not one more capable of eliciting aroma than ammonia. All volatile bodies are of course apt to increase the fragrance of a substance, by carrying the vapour with rapidity to the nasal organs, and diffusing it over a greater amount of surface. Ammonia, however, seems to possess a greater power than is dependent upon mere volatility. To illustrate this, I may state the following experiment:

I placed in a small still a watery solution of ammonia, and added a solution of essential oil of lemons and nutmegs in spirits of wine. The proportions of oil of lemons and oil of nutmegs were very small; the former being half a drop, and the latter one-eighth of a drop to each pint of fluid. Having adapted the head, I drew carefully over a quantity of spirit corresponding to the spirituous solution added, and found it produce a spirit impregnated with ammonia, but of a very fragrant character. Its aromatic power was perceptible as well in its strong state as when reduced with water. The liquid remaining in the still, sent forth very fragrant exhalations, more particularly of the nutmeg. When we consider the minute proportions of aromatic essential oils employed, it certainly appears a case confirmatory of the statement of M. Robiquet, that ammonia lends as it were its volatility to bodies, the odour of which, without such an auxiliary, would be scarcely perceptible.

Although the fact of the ammonia being in this case the exciting agent is evident, yet it is singular that after all the ammoniacal vapour has been driven over, the *caput mortuum* should retain a strong aromatic flavour. The subject of aroma is, however, altogether involved in comparative obscurity. We know that some proprietary perfumes have gained celebrity, and from what circumstance?—the discovery of a new odoriferous plant or oil? No: but simply because the essential oils are mixed in certain proportions with spirit of wine. Some metals having no odour, emit most powerful exhalations when combined with an inodorous substance. In the manufacture of British Eau de Cologne, it is well known that the addition of a small

quantity of the oil of orange-flower (Neroli) alters the character of the perfume, and many other cases might be enumerated.

Among the investigators of the subject of aroma, we may mention M. Fourcroy, who supposed that odours were merely the effect of simple solution of certain bodies in air. But M. Robiquet is much more conclusive and explicit. He says, when speaking on this subject, "aroma in many instances requires, for its development, the addition of some third body, which, though in itself possessing none of the characteristic odour, yet is absolutely necessary as an intermede, varying in its nature according to that of each odorous substance, as the mordaunt requires to be varied by the dyer, according to the nature of the colouring matter which it is intended to fix upon the cloth." This is certainly a plausible theory, and one which explains many of the singular effects produced by the mixture of substances in reference to smell.

But does the addition of the third body, referred to above, not cause an alteration in the particles of the various bodies, thus preventing the organs of taste and smell discovering the predominance of a single ingredient, but receiving all as a new compound? The change is completed instantaneously, and frequently, without any appearance of decomposition or chemical action, and sometimes without even difference of colour; can we, then, attribute the changes to a mechanical transposition of the particles of the substances combined, increased or destroyed according to the quantity of some one ingredient, which, when added, seems to usurp an authority, which it exercises by displacing the particles of other bodies, keeping itself concealed, but showing its presence by so far altering the odour of the compound?

The subject thus briefly referred to is one of great interest, and may yet attract the notice of some able investigators.

55, George Street, Edinburgh, 1st October, 1842.

ON THE PREPARATION OF BLISTERING PLASTER

BY MR. INCE.

The Pharmaceutical Journal for January last contains a paper, by Mr. Donovan, of Dublin, on the advantages of applying a high temperature in the preparation of blistering plaster. My attention has been recently directed to the subject of this paper, in consequence of the following incident, which was communicated to me by Mr. Dowling, of Bristol. Some blistering plaster which was found to be deficient in power, was submitted to the action of heat, at a temperature of 250°, for about half an hour,

in accordance with Mr. Donovan's directions, with the view of increasing its activity.

During this process the plaster was gently stirred with a spatula, but on its completion, the operator was suddenly seized with giddiness, and in a few hours was frightfully blistered, especially in the inner part of the eye-lids. Fever supervened, and but for the active antiphlogistic treatment, which was promptly adopted, the experiment might have cost him his life.

It was evident from this experiment, that much of the active principle of the fly was dissipated by the heat employed, and it may be a question, whether this objection would not counterbalance the supposed advantage of the heat, in rendering the cantharidine more completely diffused through the fat.

The plaster prepared according to the directions of the Pharmacopœia, I have always found to be effective, provided the cantharides employed in making it be fresh, and the plaster be kept for some length of time before using it. Many, I have no doubt, will be able to confirm this fact from their experience. I used formerly to be frequently perplexed by complaints against newly-made blistering plaster, that it failed to produce the desired effect, although the greatest care had been bestowed upon its preparation ; but such complaints were never made when the plaster had been long kept. I was then unable to account for these facts, but from the result of the experiments of Mr. Donovan and others, I think we may reasonably consider that the vesicating principle is at first but imperfectly extracted and dissolved by the fat, remaining, as Mr. Donovan says, "locked up in the scaly armour of the fly," and that while in this state, the fat may even tend to defend the skin from the action of the powdered fly. In the course of time, however, a more perfect solution of the cantharidine takes place, and then the plaster becomes more active.

I am not aware that blistering plaster, when properly kept, loses any of its vesicating properties with age. I have frequently witnessed its powers when several years old, and, in one memorable instance, had some recovered from the wreck of a vessel containing several tins of it, which had been under water for more than two years, and which yet retained its efficacy unimpaired.

Mr. Edwards observed, that Mr. Ince's observations did not invalidate the recommendation of Mr. Donovan to employ a high temperature in preparing emplastrum cantharidis, but merely demonstrated the necessity of avoiding evaporation, by performing the operation in a closed vessel.

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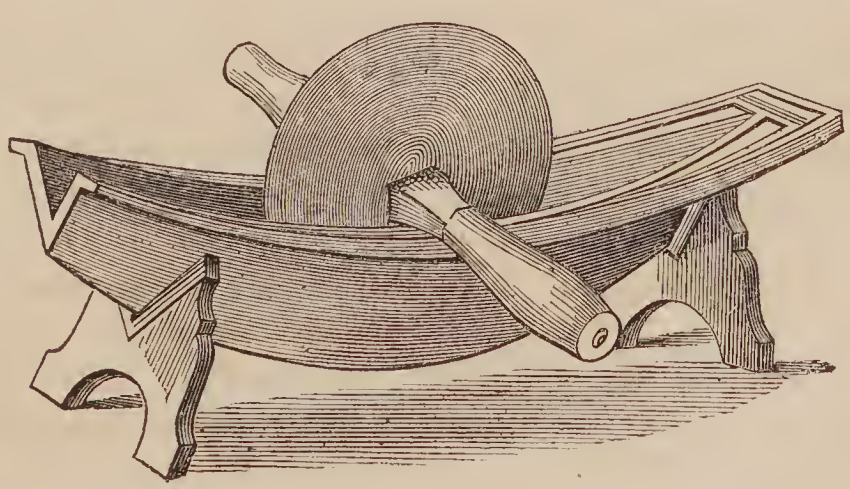
Mr. Frederick Bell.—Four Evaporating Basins (Sevre ware).

Mr. Buckles, *Peterborough.*—Chinese Mortar and Pestle, represented in the following wood-cut :



OBSERVATIONS ON ATOMIC WEIGHTS

SUGGESTED BY

SOME RECENT CONTINENTAL INVESTIGATIONS.

In 1815, Dr. Prout published (anonymously) in the sixth volume of the *Annals of Philosophy* (page 321) a paper "*On the Relation between the Specific Gravities of Bodies in their Gaseous State, and the Weights of their Atoms,*" in which he threw out the idea that the atomic weights of bodies were multiples by a whole number, of the atomic weight of hydrogen. This notion appears to have been adopted by Dr. Thomas Thomson, the Regius Professor of Chemistry in the University of Glasgow, who undertook a series of analytic investigations to prove its accuracy. The results he has published in his "*Attempt to establish the First Principles of Chemistry by Experiment,*" in 2 vols., published in 1825.

But the correspondence between Prout's hypothesis, and the results of Thomson's experiments, was so startlingly precise, while the analyses of other, especially continental, Chemists, differed so considerably from those of Thomson and his pupils, that great distrust has prevailed amongst Chemists as to the accuracy of his statements, and at the present time, there are few Chemists, whether British or Continental, who have supported Prout's hypothesis, or adopted Thomson's atomic weights*. The results of the earlier experiments of Berzelius on the atomic weight of lead, confirmed by his later ones in 1830†, appear in complete contradiction to Prout's notion, which, therefore, has been almost universally rejected.

In 1833, the late Dr. Turner (*Phil. Trans.* 1833) observed that "Dr. Prout's hypothesis, as advocated by Dr. Thomson, that all atomic weights are simple multiples of that of hydrogen, can no longer be maintained;" and he further asserted that the hypothesis was "at variance with the most exact analytic researches which have been conducted."

In 1839, Mr. Richard Phillips (*Phil. Trans.* for 1839, p. 35) published some experiments, from which he inferred, "that no material, and scarcely even any appreciable error can arise from considering the equivalents of hydrogen, oxygen, azote, and chlorine, as 1, 8, 14, and 36, respectively," thus confirming Prout's hypothesis.

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* Thomson's work was made the subject of a most bitter, abusive, and unfair criticism by Berzelius in his *Arberetälre* for 1837. See the *Philosophical Magazine*, N.S. vol. iv., page 450, 1828. For Thomson's reply, see the same work, vol. v. 1829.

† Poggendorff's *Annalen*, vol. xix, page 310 to 315, 1830.

In 1841, MM. Dumas and Stas published (*Annales de Chimie et de Physique*, t. 1^me., 3 série, p. 5) an elaborate set of experiments to determine the atomic weight of carbon, the results of which appeared to show that the number adopted by Prout for this element was correct. Assuming 100 to be the atomic weight of oxygen, 75 will be (according to Prout and Thomson) the number for carbon. Now the experimental results of Dumas and Stas gave 74.982 as the atomic weight for graphite, and 75.005 that for diamond, numbers which most closely approximate with that of Prout.

Shortly afterwards MM. Erdmann and Marchand (*Pharmaceutisches Central Blatt für* 1841, p. 462; also *Philosophical Magazine* for Oct. 1841, p. 332-3) undertook a series of experiments on the same subject, with results confirmatory of those of Dumas and Stas. The mean of their experiments on diamonds and graphite give 75.07 as the atomic number for carbon; and they adopt 75 as the true one.

About the same time, however, there appeared a paper "*On the Atomic Weight of Carbon*," by MM. Redtenbacher and Liebig (see *Phil. Mag.*, vol. xix., p. 210, Sept. 1841), in which the authors declare that the hypothesis, that the atomic weights of simple bodies are multiples of that of hydrogen by whole numbers, is quite unfounded; and assert that the true atomic weight of carbon is 75.854.

In the last number of the *Philosophical Magazine* (November, 1842) is an extract of a letter from Berlin to Mr. Francis, stating that "MM. Marchand and Erdmann are at present engaged in a series of researches which seem to prove that Prout's idea, that all atomic weights are multiples of that of hydrogen, is correct. They have as yet examined only the following bodies:—

Oxygen	100	8	Calcium	250	20
Hydrogen	12.5	1	Chlorine	450	36
Carbon	75.	6	Silver	1250	100
Nitrogen	175	14	Lead	1300	104"

In consequence of the difference of opinion which has existed, and still prevails, to a certain extent, among Chemists, we have thought it better to defer, for the present, the publication of a table of equivalents. When the doubtful points have been satisfactorily decided, we shall take the earliest opportunity of publishing the result.

ILLUSTRATIONS OF THE PRESENT STATE OF PHARMACY IN ENGLAND.

BY RICHARD PHILLIPS, F.R.S., &c.
Honorary Member of the Pharmaceutical Society.

Before I proceed to state the results of the additional experiments which I have performed in reviewing the present state of Pharmacy, I shall offer a few remarks on the note which you have appended to my observations, on the strength of nitric acid.

You state that some of the most extensive manufacturers of mineral acid assert, that nitric acid of sp. gr. 1.5 is practically objectionable as an article of commerce, being generally a coloured acid, and having a tendency to assume a still deeper colour by keeping. I must confess that my experience does not warrant these conclusions; I have kept acid of this degree of strength, possessing a slight yellow tint, even in a flint glass bottle, for many months, I believe, indeed, for some years, without observing any increase in the depth of its colour. Admitting, however, for a moment, that the colour by long keeping becomes more intense, and that the acid is then "practically objectionable as an article of commerce," let me enquire what right the Chemist has to substitute an article of commerce for one of the Pharmacopœia? The college do not require a colourless acid; but if the public do, let them have it, but do not permit a medicine to be raised or reduced in strength to suit the fancy of those who wish for a colourless acid.

Potassæ Carbonas is the preparation which I shall next notice. The preparing of this, I need hardly state, is extremely simple. Among the college tests are non-precipitation by chloride of barium or nitrate of silver, after saturation with nitric acid; and also, that it should then give no precipitate on the addition of carbonate of soda.

The specimen which I first procured gave, after saturation with nitric acid, 5.5 per cent. of chloride of silver, equivalent to nearly 3 of chloride of potassium, and 2 per cent. of sulphate of barytes, denoting 1.5 of sulphate of potash; by adding ammonia and its carbonate, there were obtained small quantities of alumina or silica, and carbonate of lime. The proportion of water which the sample contained, I omitted to determine; but supposing it not to have contained more than the proper quantity, amounting to 16 per cent., we may reckon that this article consisted of about

Carbonate of potash . .	78
Water	16
Impurity	6
	100.

I tried only one specimen more of this salt, for the state in which it is generally met with, will be sufficiently indicated by that of the different samples of liquor potassæ, presently to be noticed. The second specimen contained scarcely a trace of sulphate of potash, but it yielded, after saturation with nitric acid, 2.9 per cent of chloride of silver, equivalent to 1.5 of chloride of potassium. In other respects it appeared to be of good quality.

Liquor Potassæ Carbonatis. As this preparation is a mere solution of 20 ounces of carbonate of potash in a pint of water, it is hardly to be expected that any material deficiency should be found in it, except such as has been already noticed as existing in the carbonate itself. This, however, was far from being the case; the specific gravity of this solution should be 1.473, that of the first specimen which I obtained was only 1.426, and I find, by direct experiment, that supposing the carbonate of potash to have contained only the usual quantity, or 16 per cent. of water, this preparation must have been obtained by dissolving about 18 ounces of it in a pint of water; the second specimen of liquor potassæ carbonatis which I procured was still more dilute, its specific gravity being only 1.358, and this must have been prepared, allowing the usual quantity of water in the carbonate of potash, by adding scarcely 14 ounces of it, instead of twenty to the pint of water.

Liquor Potassæ. This preparation, although not so simple as the last, is yet not sufficiently complex to admit of any easy explanation when discrepancies occur. The directions are to take fifteen ounces of carbonate of potash, eight ounces of lime, and a gallon of boiling distilled water; the carbonate of potash is to be dissolved in half of the water, the lime to be slacked by a little of the rest, and the remainder is to be added to the slacked lime and solution of carbonate of potash. The clear liquor, after standing, is to be poured off.

Among the properties which it is stated this solution should possess, are the following:—its density, 1.063; when saturated with nitric acid, chloride of barium, or nitrate of silver, should occasion but slight precipitation.

I repeat, that one would imagine that the directions for this preparation were sufficiently simple, and the tests of its purity of easy application enough to ensure an equality of strength, of course always excepting, with regard to its strength, the different degrees of impurity which the carbonate itself may contain, and these are not likely to influence the density of the preparation, which, as already stated, should be 1.063. When the solution is of this specific gravity, I find, both by evaporation to

dryness, and also by conversion into sulphate, that it contains as nearly as possible eight per cent. of hydrate of potash.

This solution, I may remark, in addition to the tests already stated, should be but slightly, if at all, rendered turbid by lime water.

No. 1. The specimen of this solution which I first obtained had a specific gravity of only 1.015. It was, however, so free from carbonate of potash, that it gave no precipitate with lime water, and with nitrate of silver and nitrate of barytes, merely very slight precipitates after saturation with nitric acid; but then it contained only about 1.6 per cent. of hydrate of potash instead of 8 per cent., and consequently its strength was to that which it ought to have been only as one to five.

After some time had elapsed, I sent again to the same Chemist for this preparation: that which I obtained on this occasion was of specific gravity 1.040, and contained, taking the mean of two experiments, which did not differ much, 4.75 per cent. of hydrate of potash, so that, although procured from the same source, it was three times as strong as the former preparation. Having in my last communication particularly alluded to the dangers which may arise from procuring medicines of different strengths from different sources, I shall now merely observe, that those dangers are multiplied when the same preparation is obtained of different strengths from the same source.

The direct use of this solution as a medicine is not, however, the only inconvenience which may arise from variation in its strength, and more especially when, as in the present case, it is too weak. A considerable time since, I called at a chemical manufactory, and my attention was drawn by the superintendent to the colour of the Hydrargyri Binoxydum of the Pharmacopœia, of which a considerable quantity had been recently prepared. This, it will be remembered, is obtained by adding liquor potassæ to a solution of bichloride of mercury. On merely inspecting the article shown to me, I was satisfied that it was not pure binoxide, but contained much oxichloride of mercury. Well knowing that if the bichloride of mercury had been treated with a sufficient quantity of liquor potassæ, that a very different substance would have been formed, I requested leave, and was permitted, to question the chemical operator. In answer to my inquiries he assured me, that proper quantities of the solution of potash and bichloride of mercury had been employed; but on further inquiry, it turned out, if I remember right, that the liquor potassæ was deficient in strength, because avoirdupois ounces of the carbonate had been employed instead of troy ounces.

I very recently sent to the same parties for liquor potassæ, and I must admit that my interference appears to have been attended with beneficial results, as far as the density of the preparation was concerned, for the solution which I obtained was of specific gravity 1.064; but it must be also admitted that it gave a considerable precipitate with lime water, showing the presence of carbonate of potash; and after saturation with nitric acid, nitrate of silver yielded a copious precipitate of chloride, and with chloride of barium I obtained an abundant precipitate of sulphate of barytes. It was therefore evident that, although the density of the preparation was now even rather greater than required, there existed in it carbonate and sulphate of potash and chloride of potassium to a very improper degree.

The next specimen obtained was of specific gravity 1.086, which, it will be observed, differs from all the preceding in being of much greater density than directed in the Pharmacopœia. The mean of two experiments gave about 11 per cent. of solid residue; it was therefore apparently stronger than it ought to have been, in the proportion of 100 to 72, and than No. 1 in that of 100 to 14.5. I say *apparently* stronger, for I must admit that its real power was considerably less than that indicated by evaporation, for it was rich in carbonate and sulphate of potash and chloride of potassium.

I next obtained the preparation of specific gravity 1.068; it contained all the usual impurities in a very considerable degree, and especially carbonate of potash, on which account it not only precipitated lime water, but effervesced with an acid.

Another specimen which I procured had a specific gravity of 1.060, and this, unlike the above described, was somewhat weaker than the Pharmacopœia preparation; and although it contained but little carbonate of potash or chloride of potassium, it gave, after saturation with nitric acid, a very considerable precipitate with nitrate of barytes, indicating the presence of sulphate of potash.

In concluding my examinations of this preparation, I may remark, that while deficiency of strength is to be imputed chiefly to the employment of too small a proportion of carbonate of potash, I think it probable that the too great density which two specimens possessed, may be attributed to the operators having boiled the mixture, in order to ensure the perfect action of the lime, during which water must be evaporated, and the solution proportionally concentrated. I may further observe, that it is quite needless to employ heat, and its use produces the ill effect of rendering the preparation of uncertain strength.

ON THE PHENOMENA OF FERMENTATION.

BY GEORGE FOWNES, PH. D.,
Lecturer on Chemistry at Charing Cross Hospital.

[*Concluded from our last Number.*]

The acidification to which beer is subject when exposed to the air—in a partially empty cask for example—is no doubt due to the oxidation of the alcohol under the influence of decaying azotized matter, and its conversion into acetic acid; an effect quite different from that of the souring of wort before alluded to, and which is probably occasioned by the development of lactic acid out of the sugar. In the most perfect kinds of beer, as for example that made in the best breweries of Burton-upon-Trent for the Indian market, the fermentation is so perfect of its kind, the destruction of the azotized matter so complete, and the whole process so well conducted, that the liquor is almost incapable of becoming sour. This is also the case with old strong beer, which has been long stored in cool cellars, and where it seems the little oxygen creeping in through the pores of the wood has been employed in the gradual decomposition of the azotized substances in question, instead of exerting its powers upon the alcohol.

Most persons have heard of the celebrated Bavarian beer, a liquor very much esteemed in Germany;—the secret is said to lie in the peculiarities attending its fermentation, which is carried on in very flat, shallow vessels, freely exposed to the air, and protracted for a great length of time—a month, or even six weeks. Now, we know what would be the effect of leaving our beer in the fermenting vessels so long; it would be vinegar, if made at the common temperature of the air; but then the German brewer takes care to work in the winter, so that the temperature of his liquor never rises above 45° or 50° under which circumstances *alcohol is incapable of oxidation*, although the decay and utter destruction of the azotized principles proceeds rapidly, and the liquor when complete is no longer susceptible of becoming sour.

The practice of the distiller, who prepares alcohol for commercial purposes in enormous quantity, by subjecting to distillation a sort of beer made from grain or even potatos, differs considerably from that of the brewer as regards the fermentation of his liquor or "wash;"—in making beer it is indispensable that a large portion of the sugar of the wort remain unchanged, for the reasons already discussed, but when the object is merely the alcohol the liquor contains, the skill of the manufacturer is directed towards obtaining the greatest possible amount of that substance from a given quantity of sugar. To do this, the fer-

mentive process is pushed to the utmost by frequent and large additions of beer-yeast; no regard being paid to the circumstance that, towards the close of the operation, the liquor becomes highly acid, since it is better to lose a little alcohol in the shape of vinegar, than to leave any notable quantity of sugar unchanged.

The distiller besides uses raw grain, not alone, but mixed with sufficient malt to furnish diastase for the conversion of the starch into sugar in the mashing. Potato-brandy, so largely used in some parts of the continent, is made on the same principle, the crushed or rasped potatoes being infused with a little malt in hot water, until a sweet liquor is obtained capable of furnishing much alcohol. The spirit, got by this method, however, is apt to be contaminated with a highly deleterious volatile oil, generated in some yet unknown manner during fermentation, and to get rid of which exercises the art of the rectifier.

Yeast itself, our ordinary alcoholic ferment, deserves a slight notice. That which is deposited from beer, and which is most familiar, presents to the eye the aspect of a somewhat granular buff-coloured substance, very little soluble in water, and appearing under the microscope, according to several observers, to be composed of a multitude of little roundish bodies, destitute of crystalline structure, and which occasionally group themselves together in rows or strings; a circumstance which has led some persons to consider them as living plants of a low order of organization, and to imagine them to multiply and increase their numbers under favourable circumstances by a real act of reproduction. It has been shown, however, that this peculiarity of arrangement is common among precipitates, even inorganic, when completely amorphous.

When yeast in its ordinary wet condition is left to stand, it very rapidly loses its exciting power; in point of fact, it passes and goes beyond that particular condition of decay by which alone the vinous fermentation can be set up, and after some time runs into the ordinary putrefactive decomposition to which all bodies of like chemical nature are liable. Even in its most energetic state it is in the act of decomposing; it contains salts of ammonia ready formed, a substance not to be found in the vegetable albumen in which the yeast originated, and it constantly emits carbonic acid.

Although so quickly spoiled in its ordinary state, yeast, when freed from water by pressure in a cloth and careful drying, may be preserved for a great length of time, and even transported to distant countries. While dry, the progress of decomposition is arrested, but on contact of water it once more begins, and the yeast again becomes active.

The most important, because the most common and universal application of yeast, is in making bread; the panary fermentation, as it has been called, is in reality the vinous, alcohol and carbonic acid being generated out of the little sugar naturally existing in the flour, the result being a light and spongy bread, dependent on the gaseous matter thus liberated in the substance of the dough, blowing it out as it were into bubbles. For this purpose it is very essential to have a good ferment, otherwise we cannot fail to get indifferent bread. In reference to this subject It may not be considered uninteresting to the readers of this Journal to know that we possess very simple means of making yeast at will. The following short memoir on the preparation of artificial yeast was read by myself at a recent meeting of the Chemical Society of London, and its brevity must be my excuse for here subjoining it.

"It often becomes a matter of great practical importance to have it in our power to excite the vinous fermentation under circumstances in which ordinary yeast cannot be obtained. In making bread, for example, although the use of yeast may be avoided by employing what is called 'leaven' or dough which has already become sour and partially putrified by spontaneous change—a practice which has been followed from the most remote antiquity, and is still occasionally in use. The bread so made is always to be distinguished by a peculiar sour and nauseous taste and smell, and can never bear comparison with that fermented by yeast.

"The object of the present notice is to point out a method by which yeast of the most unexceptionable quality can be artificially produced at will. I am aware that some substitute for ordinary ferment in brewing has long been known to certain persons who go about the country and impart this secret to those who are willing to purchase it. Of the nature of this preparation I am ignorant, and a reference to systematic chemical works will suffice to show, that whatever it be, it has never been made public.

"On turning to Berzelius it will be found stated, that although the reproduction, as it were, of yeast, the conversion of a small into a large quantity, is a very easy thing, yet to produce that substance from the beginning is very difficult. He describes a process for this purpose on the authority of Dr. Henry, which consists in taking a strong infusion of malt, saturating it with carbonic acid, and then exposing it for some days to the proper fermenting temperature, when a small quantity of yeast is gradually formed and deposited, which may, by various contrivances, be made to give origin to a larger. I shall have occasion to notice presently the behaviour of a malt-infusion, when left to itself at

a temperature of 70° or 80° for some time, and to show that the addition of carbonic acid is wholly unnecessary.

"The principle of 'induced chemical action' which Liebig has assumed to explain, a great number of those extraordinary phenomena to which Berzelius gave the term 'Katalysis,' and which principle has been so fully confirmed and even, perhaps, extended, by the late valuable researches of MM. Boutron and Frémy on the lactic acid fermentation, serves to solve this difficulty, as it will doubtless many others of far greater magnitude and importance. It has been shown that 'the kind of chemical change going on in the decomposing azotized body or ferment, determines the kind of decomposition which shall occur in the neutral ternary substance subject to its influence;'—that diastase, for example, according to its peculiar condition, whether fresh from the germinated grain, slightly putrified, or in a still more advanced state of that change, possesses the singular power in the first case of changing starch into dextrin, and ultimately into grape-sugar; in the second of causing the conversion of sugar into lactic acid; and in the third and last, of exciting the vinous fermentation.

"Now, if common wheaten flour be mixed with water to a thick paste, and exposed, slightly covered, to spontaneous change in a moderately warm place, it will be observed to run through a series of changes which seem very closely to resemble those described by MM. Boutron and Frémy in the case of diastase.

"About the third day of such exposure, it begins to emit a little gas, and to exhale an exceedingly disagreeable sour odour, much like that of stale milk;—after the lapse of some time, this smell disappears, or changes in character, the gas evolved is greatly increased, and is accompanied by a very distinct and somewhat agreeable *vinous* odour; this will happen about the sixth or seventh day, and the substance is then in a state to excite the alcoholic fermentation.

"A quantity of brewer's wort is next to be prepared in the usual manner by boiling with hops, and when cooled down to 90° or 100°, the decomposing dough before described, after being thoroughly mixed with a little tepid water, is added to it, and the temperature kept up by placing the vessel in a warm situation. After the lapse of a few hours, active fermentation commences; abundance of carbonic acid, having its usual agreeable pungent smell, is disengaged; and when the action is complete and the liquor clear, a large quantity of excellent yeast is found at the bottom, well adapted to all the purposes to which that substance is applied.

"In one experiment the following materials were used:—a small handful of ordinary wheat-flour was made into a thick paste with

cold water, covered with paper, and left seven days on the mantel-shelf of a room where a fire was kept all day, being occasionally stirred: at the end of that period three quarts of malt were mashed with about two gallons of water, the infusion boiled with some hops, and when sufficiently cooled, the ferment added. The results of the experiment were a quantity of beer (not very strong, it is true, but quite free from any unpleasant taste) and at least a pint of thick barm, which proved perfectly good for making bread.

"It appears to me that this simple plan would enable distant residents in the country, and settlers in the colonies, to enjoy the luxury of good bread when a little malt could be got,—a very easy home manufacture from grain of any kind: the hops might probably be omitted when the yeast alone was the object.

"A moderately strong infusion of malt which has not been boiled, suffered to stand in a warm place for some days, speedily becomes sour and turbid, and begins to evolve gas; this change rapidly progresses, carbonic acid is given off plentifully, and a deposit of thick, insoluble, whitish matter formed, which readily excites fermentation in a dilute solution of sugar. The supernatant liquid contains alcohol, acetic acid, and, I believe, lactic acid.

"When wort which has been boiled and hopped is set aside to decompose spontaneously, the change it undergoes appears to to depend very much upon its strength. When weak, three or four days elapse before anything is noticed: a scum then collects upon the surface, and a brown flocculent substance is thrown down, incapable of exciting fermentation in a solution of sugar, while the liquid gives off a flat offensive smell. If the infusion experimented on be stronger, then the change is different; the liquid becomes turbid from the separation of a yellowish adhesive substance, a good deal of gas is very slowly emitted, alcohol is formed, and the deposit at the bottom of the vessel proves a pretty active ferment to sugar. The acidity of the liquid is but trifling, and its smell is somewhat disagreeable. These differences in the behaviour of boiled wort may also depend upon the quantity of hops added, and the length of time during which ebullition had been continued.

"The effect produced in a spontaneously fermentable liquid by vegetable acids or acid salts, such as cream of tartar, is a curious subject of inquiry. From an experiment made upon some wort, it appeared not improbable that the result of such addition showed an interference in the formation of lactic acid. We know that when the juice of grapes, or currants and gooseberries, is exposed to the air, the vinous fermentation is set up at once; whereas, in an unboiled infusion of malt, which is destitute

of the substances in question, lactic acid seems to be first formed, although, ultimately, the two fermentations go on together.

" I stated when speaking of the spontaneous decomposition of wheaten-dough, that an acid state preceded that in which it became an alcoholic ferment; and if in this condition it be mixed with a little dilute solution of common sugar, and the whole kept warm for several days, it furnishes a sour liquid which is rich in lactic acid, and from which white chrystallized lactate of zinc is easily prepared. There is a tendency in the liquid to run into the alcoholic fermentation, and to produce vinegar by a subsequent change, but still the quantity of lactic acid so formed is very considerable.

" Common wheat gluten, then, in its mode of decomposition, strikingly resembles diastase; like that substance it runs in succession through two different dynamic conditions, being successively a lactic acid and an alcohol ferment. It is too much to expect that it might, by proper means, be detected in a third condition, namely, as a " sugar ferment," like diastase itself in the state in which it exists in malt? Is it not possible that diastase, as a definite proximate principle, has no more existence than yeast?—that its powers are purely dynamic, and that it is, in short, nothing more than the gluten of the seed in one of its earliest stages of decomposition. This is an interesting inquiry, but its prosecution will be somewhat difficult, from the rapidity with which these changes succeed each other. It must be remembered, that no one has yet succeeded in getting diastase in a state fit for analysis*."

It is a fact unfortunately but too well known to those engaged in pharmaceutical practice, that not unfrequently syrups and other preparations containing a large quantity of sugar, are discovered to be in a state of effervescence—fermentation in short. These are, no doubt, true cases of vinous fermentation, although occurring under very unusual conditions. One would be tempted to think the proportion of sugar too great, and that of the possibly present azotized matter too small, for a change of this sort; there can be, nevertheless, but little doubt upon the subject, the great point being to find some means of remedying an evil sometimes very serious.

The most plausible plan which presents itself is that of increasing the dose of sugar, so as to get in all cases an exceedingly thick syrup, and at the same time to boil well in order to coagulate as much as possible albuminous matter. A month since, an opportunity presented itself of examining a sample of syrup of orange peel in a state of active fermentation; it was put into a retort, and

* Memoirs of Chemical Society of London, vol. i.

about a third part distilled over, which appeared to contain alcohol; the residue was then transferred to a bottle and set aside. It is now a thick, pale coloured, transparent syrup, quite free from every thing like effervescence; a few regular crystals of sugar have been deposited against the glass, but this can hardly give rise to much inconvenience.

It must be obvious that in this, as well as many other practical questions of great importance in Pharmacy our only hope is to be placed in exact observation of all that passes, and occasional judicious experimental inquiry, within the reach of every diligent member of the profession, who may thus, with direct benefit to himself and his neighbours, powerfully contribute to elevate in dignity and public influence the profession itself.

THE SOLUBILITY OF LEAD IN WATER.

TO THE EDITOR OF THE PHARMACEUTICAL JOURNAL.

SIR,

OBSERVING in your last number a communication from Mr. Morson on the Solubility of Lead in Water, I beg to offer a few remarks on the same subject. Many years ago, having occasion to remove a wooden pipe and pump from a well, I wished to replace it with one of metal. Having some suspicion that the water would be acted upon by the metals usually employed, I adopted the following mode to ascertain the fact, and at the same time to mark any difference of solubility which might exist in other waters:

Clean filings (free from oxide) of lead, copper, and iron*, were immersed in stoppered bottles of distilled water, river water, and various spring waters, the bottles being filled completely to exclude atmospheric air; after remaining several days, occasionally shaken, they were examined, and each was found to contain a notable quantity of the metal; the water of the well containing a large quantity of calcareous compound had by far the most solvent power. Are not metals and metallic alloys readily acted upon by alkaline salts?

I am, Sir, yours, &c.

Southampton Street. W. INCE.

* In the seventh volume of the *Quarterly Journal of the Royal Institution*, 1819, *is a memoir on the combined agencies of oxygen gas and of water* in the *oxidation of iron*, by Marshall Hall, M.D., in which it is shown, by the result of various experiments, that water, deprived of atmospheric air and of oxygen, exerts no influence on the metal. It had previously been supposed that iron possessed the power of decomposing water, attracting the oxygen, while the hydrogen was liberated. To this theory Dr. Marshall Hall directed particular attention, and found it to be incorrect.—ED.

A long article on this subject is contained in Dr. Christison's *Treatise on Poisons*, and as our correspondents differ in opinion, we give the following brief summary by way of explanation. Vitruvius and Galen were aware that water conveyed through lead pipes was liable to contamination. Dr. Lambe, of Warwick, in the year 1802, inferred, from his researches, that the solvent power of spring water on lead, is increased by some of the saline ingredients. Guyton Morveau came to an opposite conclusion, and stated, in 1809, that pure distilled water acts rapidly on lead; but that some natural waters have little or no action on it, in consequence of the salts they hold in solution. Dr. Thomson, of Glasgow, in 1816, supported Dr. Lambe, in asserting that most spring waters act upon lead, but considered that the lead is held in suspension, not in solution, and that the quantity is too minute to prove injurious. Captain Yorke, in 1834, found that the solvent power of the water was chiefly dependent on the presence of carbonic acid, and that the compound is generally a hydrated carbonate with excess of oxide of lead. MM. Labarraque and Pelletier, on examining orange-flower-water, in 1830, found it contaminated with lead, resulting from the action of the water on the lead solder in the copper vessels in which it was contained, although atmospheric air had been almost entirely excluded. They attributed this to careless distillation, supposing that a portion of the decoction had been driven over, and having become acetous by keeping, had acted on the lead in a manner which they did not find to be the case when the water is pure. M. Chevallier confirmed this opinion.

The *British Annals of Medicine*, vol. i. page 15, contains a letter from Mr. Squire, on the Presence of Lead in Orange-flower-Water, which was discovered on the addition of iodide of iron in preparing a prescription. Golden-coloured crystals of iodide of lead were deposited. Mr. Squire recommends the purification of the water, when thus contaminated, by the immersion of a piece of zinc wire, and the use of iodide of potassium as a test of its purity, a yellow turbid appearance being observable if lead be present.

Orange-flower-water is imported from France, in vessels of lead, or at least soldered with that metal, on which account these observations are important.

Dr. Christison investigated the subject in 1829, and subsequently, and has come to the conclusion that Guyton-Morveau is correct in attributing a preservative power to neutral salts. He found this power to exist, in different degrees, in the case of sulphates, muriates, carbonates, hydriodates, phosphates, nitrates, acetates, tartrates, and arseniates. He states, that "the protecting powers of acetate of soda, nitrate of potash, muriate of soda,

sulphate of lime, arseniate of soda, and phosphate of soda, are inversely as the solubility of the acetate, nitrate, muriate, sulphate, arseniate, and phosphate of lead;" and observes—

"The general result of these experiments appears to be, that neutral salts, in various and, for the most part, minute proportions, retard or prevent the corrosive action of water on lead; allowing the carbonate to deposit itself slowly, and to adhere with such firmness to the lead, as not to be afterwards removable by moderate agitation; adding subsequently to the crust other insoluble salts of lead, the acids of which are derived from the neutral salts in solution; and thus, at length, forming a permanent and impermeable screen, through which the action of the water cannot any longer be carried on*."

"Most spring waters, unlike rain or snow water, have little or no action on lead, because they generally contain a considerable proportion of muriates and sulphates†."

The same author also states, that some natural waters which he has examined appear to be quite inert in this respect; he also observes, that old lead pipes become entirely protected from the action of any water by means of the film of carbonate which adheres to them.

The result of further researches is contained in a paper, by Dr. Christison, which was read at a meeting of the Royal Society of Edinburgh, on the 7th of February, 1842, and the following are the practical conclusions at which he arrives respecting the employment of lead-pipes for conducting water:

"1. Lead pipes ought not to be used for the purpose, at least where the distance is considerable, without a careful examination of the water to be transmitted.

"2. The risk of dangerous impregnation with lead is greatest in the instance of the purest waters.

"3. Water which tarnishes polished lead when left at rest upon it in a glass vessel for a few hours, cannot be safely transmitted through lead pipes without certain precautions.

"4. Water which contains less than an 8000th of salts in solution, cannot be safely conducted in lead pipes without certain precautions.

"5. Even this proportion will prove insufficient to prevent corrosion, unless a considerable part of the saline matter consist of carbonates and sulphates, especially the former.

"6. So large a proportion as a 4000th, probably even a considerably larger proportion will be insufficient, if the salts in solution be in a great measure muriates.

"7. It is, I conceive, right to add, that in all cases, even though the composition of the water seems to bring it within the conditions of safety now stated, an attentive examination should be made of the water, after it has been running for a few days through the pipes. For it is not improbable that other circumstances, besides those hitherto ascertained, may regulate the preventive influence of the neutral salts.

"8. When the water is judged to be of a kind which is likely to attack lead pipes, or when it actually flows through them impregnated with lead, a remedy may be found, either in leaving the pipes full of the water and at rest for three or four months, or by substituting for the water a weak solution of phosphate of soda in the proportion of about a 25,000th part."

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* Treatise on Poisons. Third edition, 1835. Page 483. † Page 486.

The analysis of the deposit formed in lead pipes, after the continuous transmission of water in them for twenty months, is as follows:

	Grains.	Grains.	Grains.
Oxide of lead ..	21.035	24.275	20.870
Carbonic acid ..	2.641	2.992	2.497
Water	0.535	0.650	0.547
Deposit....	24.211	27.917	23.914

From these three experiments it would appear, that the compound consists of carbonate of lead with hydrated oxide. Dr. Christison observes,

"On first ascertaining the nature of this substance, I imagined it was a new body not previously recognised by Chemists. I have since found that Mulder conceives the common carbonate of lead, the white lead of commerce, to be of the same nature. He has recently discovered it to consist sometimes of two, and sometimes of three equivalents of neutral carbonate, united with one of hydrated oxide; and he states, that the whitest and finest varieties contain most carbonic acid."

See *Richardson's Confirmation of Mulder in Graham's Chemistry*, p. 591.

For further details we must refer our readers to Dr. Christison's work, and also to various papers in the *Annales de Chemie, Journal de Chimie Médicale, Philosophical Magazine, &c.*

The subject deserves the attention of the votaries of the hydropathic system, since a minute quantity of lead which under ordinary circumstances would be of no consequence, might be a serious matter to those who swallow water by the gallon.—Ed.

SERVING ON JURIES.

In the 1513, an Act of Parliament was passed exonerating *Surgeons* from the necessity of serving on juries and parochial offices. This privilege was extended to *Physicians* in the year 1540.

In the year 1694 *Apothecaries* were exempted from serving in the offices of constable, scavenger, and other parish and ward duties, and from attendance upon juries. The reasons for this latter exemption are thus expressed in the act:—

"Whereas the art of the Apothecary is of great and general use and benefit, by reason of their constant and necessary assistance to His Majesty's subjects, which should oblige them solely to attend to the duties of their profession," &c.

There are certain duties which individuals are called upon to perform for the benefit of the community, among which is the attendance on juries and other offices of that nature; but there is an exception to this general rule in the case of those whose professional avocations are incompatible with this sacrifice of

time, and who are therefore exempted *on public grounds*, since the performance of one office would involve the neglect of another, which is of vital importance.

The Physician and Surgeon having been exonerated for this reason, it was evident that the same principle applied to the Apothecary, who compounded the remedies; as medical advice could not be carried into effect without his instrumentality, and accordingly the lives of patients might be sacrificed unless the same privilege was extended to the three classes. The office of the Apothecary of 1694 has descended to the Dispensing Chemist of the present day, who ought therefore to enjoy the same exemption from duties incompatible with his duty to the public.

It is a matter of surprise that so many years should have elapsed without this subject receiving that attention which it deserves, and we can only account for the circumstance by supposing that it has been overlooked by the government for want of a proper representation of the facts of the case by the Chemists themselves. It is well known that many Chemists keep no assistant or apprentice, a great number have but one apprentice, who is not qualified to take the management of a shop; and when his employer is engaged in the jury-box for several days together, which is frequently the case, the lives of his customers are at the mercy of a boy, who has probably been but a few months in the establishment.

It is quite unnecessary to quote cases in which fatal accidents have occurred, or to speculate upon the danger to which the public is exposed in consequence of this oversight in the laws relating to the profession. It has too often happened that while the master was engaged on a jury, his errand-boy has been paving the way for an inquest; and it is not to be supposed that a man who is conscious that such liabilities exist at home, can enjoy that calmness and equanimity which would enable him to perform his duty efficiently in the jury-box.

We have received several letters from correspondents, in which the force of these remarks is amply exemplified; and we take this opportunity of expressing a conviction that an evil which involves so much hardship to individuals, and danger to the public at large, cannot long continue to exist after the circumstances attending it have been properly represented to the government.

We have every reason to believe that the laws relating to the medical profession will be revised during the ensuing session of Parliament, and we trust that the Council of the Pharmaceutical Society will take advantage of the opportunity which will thus be afforded of advocating the necessity of the alteration.

As it can be shown that, in this instance, the interests of the

trade and the welfare of the public are equally concerned, it not only comes within the province of the Council to exert their influence (at a proper time), but there is every prospect of a favourable result.

There are other questions which occasionally arise, and which form the subject of communications on which we cannot see our way clear to predicate so confidently. We allude more particularly to the old grievance of late hours. This is a matter on which each individual feels it to be his prerogative to act according to his discretion, and while it is admitted, by all parties, that the *universal* closing of shops at an earlier hour would conduce to the health and comfort both of principals and assistants, it is by no means certain that such a regulation, if attempted, would be universally complied with. It is to be feared, however, that unless *all* could be induced to comply, the attempt would fail, since the minority, however small, would enjoy a certain monopoly after the majority had closed their shops, which would act as an inducement to others to transgress the rule. A compliance with such a regulation could not be enforced by law, since it is the duty of the Chemist, not only during the day, but even throughout the night, to minister to the necessities of the sick if applied to.

On the other hand, we have been informed by some of our brethren, who have tried the experiment, that they have suffered no disadvantage from closing their shops an hour earlier than their neighbours, their customers having assented to the propriety of the alteration, and considerately acted upon it by restricting their wants as much as possible within the prescribed limits. There is, therefore, some reason to believe, that the public may be induced, by a proper representation of the case, to aid in the introduction of the desired reform, which aid would be quite essential, as we had occasion to observe when treating on this subject in a former number.—*See* vol. i., No. 5, pp. 220, 221.

HYDRATED PROTOSULPHURET OF IRON AS AN ANTIDOTE FOR CORROSIVE SUBLIMATE.

BY M. MIALHE.

I HAVE discovered from experiments that hydrated protosulphuret of iron, a perfectly inert substance, instantly decomposes corrosive sublimate; protochloride of iron and bisulphuret of mercury, two inert substances, are formed, from which valuable property I am induced to designate this sulphuret of iron as the best antidote for the violent poison alluded to.

I intend shortly to publish the details of my chemical and

physiological investigations on this subject, but the following chemico-physiological fact may be stated as a strong evidence of the efficacy of this antidote:

When a small quantity of bichloride of mercury is taken into the mouth, there is speedily experienced an insupportable and characteristic metallic taste. If now, the mouth be gargled with the hydrated sulphuret, in a thick state, such as it should always be used in, the mercurial taste is removed as if by enchantment. This fact requires no comment, it speaks sufficiently for itself, without further explanation.

The antidote I am now recommending is not limited in its effects to the mercurial salts, it is equally useful in counteracting the deleterious operation of several other metallic salts, especially those of copper and of lead.

The following is the mode of preparing the hydrated protosulphuret of iron:—

Dissolve any quantity of pure protosulphate of iron in at least twenty times its weight of distilled water, deprived of air by boiling, and precipitate the iron with a sufficient quantity of sulphuret of sodium, dissolved also in distilled water, deprived of air. Wash the protosulphuret thus obtained with distilled water, and preserve it in stoppered bottles, filled with boiled distilled water.

Although the preparation of this sulphuret of iron is very simple, and may be effected in a few minutes, yet it would be desirable to keep it always prepared, that no time may be unnecessarily lost in any case of poisoning.

The precaution of preserving this sulphuret out of contact of the air, must be strictly observed, as it has a great tendency to pass into the state of sulphate.—*Journal de Pharmacie.*

GLASS SYRINGES.

TO THE EDITOR OF THE PHARMACEUTICAL JOURNAL.

Sir,

I have received several communications complaining of the badly manufactured and ill-adapted glass syringes, and sold as the instruments introduced by me, and described in the seventh number* of your Transactions.

As I have no protection or patent to secure the public against these impositions, I can only recommend purchasers to take care that the instruments answer to the original delineation, and to observe, that the bulbs should not be larger than crow-quills; that they should be well rounded, and smooth; the canals should be at least a quarter of an inch long, and the tubes and pistons

* See woodcut, page 326.

formed of sufficiently strong and thick glass, to prevent the chance of breakage. I may remark, that many of those mounted with ivory soon become useless, in consequence of the giving way of the medium which is employed to fix them.

Trusting that these observations may be the means of counteracting the various complaints made against these simple instruments, which have received the approbation of the profession,

I have the honour to remain, your obedient Servant,

5, George Street, Hanover Square, W. ACTON.
Nov. 1842.

ON THE DETERMINATION OF AZOTE IN ORGANIC SUBSTANCES, BY THE PROCESS OF MESSRS. VARRENTRAPP AND WILL.

BY M. REISET.

M. REISET has submitted the new process of analysis of MM. Varrentrapp and Will* to a careful examination, with the view of ascertaining how far it may be relied upon as a means of correctly estimating the quantity of azote contained in organic bodies. He says, the fundamental conditions essential to place the new method of analysis beyond all objection, are, first, that the whole of the azote contained in the azotised substance shall be transformed into ammonia; and, secondly, that the azote of the air contained in the combustion tube, shall not, in any case, contribute to the formation of ammonia. The experiments of Berzelius, and more recently those of Varrentrapp and Will, have shown that the first of these conditions is completely fulfilled. All azotized substances, with the exception of those containing azote in the state of nitric acid, transform the whole of their azote into ammonia, under the influence of the alkaline mixture, at an elevated temperature. The combinations of cyanogen even, furnish ammonia as easily as a mixture of sal ammoniac and lime.

With regard to the possibility of the formation of a certain quantity of ammonia at the expense of the atmospheric air contained in the tube, MM. Varrentrapp and Will have made the following experiment to meet this objection. A mixture of azote and hydrogen, such as arises from the decomposition of ammonia by copper, was passed, at a red heat, 1st, over a mixture of calcined cream of tartar and lime; 2dly, over a mixture of recently prepared lamp-black and calcareous soda; and 3dly, over the simple mixture of lime and soda. In none of these cases were they able to detect the least quantity of ammonia formed.

This experiment was considered sufficient, by these authors, to establish the accuracy of the indications afforded by their process, and any excess of azote which may appear in the result of the analysis, they ascribe to impurities in the substance analyzed, or in the chloride of platinum.

These conclusions appear to me not to be sufficiently established, for although a mixture of azote and hydrogen produced no ammonia under the circumstances of MM. Varrentrapp and Will's operation: does it therefore follow that a non-azotized substance, or one very rich in carbon, when burnt with the alkaline mixture in contact with atmospheric air, never yields ammonia?

This question was rendered the more interesting, in consequence of the announcement, some time ago, by Faraday, that *non-azotized substances, such as sugar, acetate of potash, oxalate of lime, tartrate of lead, &c., when calcined*

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* See Pharmaceutical Journal, Vol. i., p. 494.

with hydrate of potash, of soda or baryta, always afford a sensible quantity of ammonia. It is evident, on reading the paper of this able Chemist, that the re-agents employed by him were perfectly pure, having been prepared by himself with great eare.

It remained to be determined with aceuraey whether the faets observed by Mr. Faraday might have some influence on the results of the proeess of analysis of MM. Varrentrapp and Will.

The following experiments appear to me to leave no doubt on this point :

The sugar employed by the authors of the proccss to prevent the too rapid absorption of the ammonia by the hydrochloric aeid, during the combustion of substances very rich in azote, also sugar burnt in the ordinary apparatus with the alkaline mixture, have always afforded me quantities of ammoniacal chloride of platinum, whieh, as will be seen, are by no means unimportant.

The ammonia obtained under these eireumstances, can only be aseribed to the azote contained in the tube, and not to the re-agents employed.

The mixture which I used was prepared with all the care possible, by ealcining at a red heat in an earthen erucible, two parts of slaked lime with an aqueous solution of one part of caustie soda recently prepared. The mass was quiekly powdered, then slightly heated to drive off any moisture it might have attraeted, and introduced while still hot into a stoppered bottle.

After first proving by experiment, that neither the alkaline mixture nor the ehloride of platinum used in my experiments, contained any azote, I proceeded to the combustion of sugar.

1st. One gramme (15.444 grains) of sugar, perfeetly white, was burnt in an ordinary tube with the alkaline mixture, which, on the addition of the chloride of platinum to the hydrochloric aeid, afforded very brilliant, yellow, insoluble erystals of chloride of platinum and ammonium, and which, after ealcination, gave .089 gramme of metallie platinum, corresponding to .0127 gramme of azote.

2d. Two grammes of the same sugar, gave under similar eireumstanees, .10725 gramme of metallic platinum, corresponding to .0153 gramme of azote.

3d. One and a half gramme of sugar-candy, in fine crystals, gave .104 gramme of metallic platinum, corresponding to .0149 gramme of azote.

I also effeeted the eombustion of stearine, and obtained ammonia from it.

The new process for the determination of azote has succeeded perfectly, in the hands of MM. Varrentrapp and Will, in a great number of cases ; several other Chemists have also reported favourably of it : these are facts whieh I am by no means disposed to doubt ; but it is important that it should be distinctly understood, that this process may lead to serious errors in operating on non-azotized substanees, or even on azotized substances which are very rieh in earbon, and the combustion of whieh is difficultly effected with the alkaline mixture.

Moreover, there exists another souree of error in the employment of this proeess, which deserves to be mentioned. I allude to the reduetion of a small quantity of the biehloride of platinum into protochloride under the influenee of the mixture of aleohol and ether.

Faraday, in his paper on some eireumstanees attending the formation of ammonia, has shown that iron, zine, and those metals, generally, which are easily oxidized, when fused in eontact with potash, give rise to the formation of ammonia, even in an atmosphere of hydrogen.

I have aseertained, in fact, that at a temperature which need not be higher than 265° Fahr., iron filings and a concentrated solution of potash afford an abundant evolution of hydrogen, and at the same time the smell of ammonia beeomes very sensible, even in operating with a grain of potash. But this formation of ammonia does not take plaee, if the operation be conducted in an atmosphere of hydrogen prepared with sulphuric acid, free from nitrous gas.—*Annales de Chimie et de Physique.*

CHINOVA-BITTER.

BY DR. F. L. WINCKLER.

In preparing a large quantity of Chinova-bitter, I had occasion to study accurately the chemical properties of this bitter matter. According to the results of these experiments, the Chinova-bitter is a well-characterized acid, which not only forms with most metallic oxides amorphous compounds soluble in water, but forms also with ammonia, soda, and potash, perfectly neutral but uncrystallizable salts easily soluble in water. The solution of the ammonia salt loses the ammonia completely, either by being evaporated under moderate heat, and even by spontaneous evaporation in the air, and, on being evaporated to a state of dryness, leaves behind the Chinova-bitter as a very easily friable, enamel-like, snow-white, amorphous mass. The potash salt is to be obtained by the evaporation of the solution in a perfectly undecomposed state, and forms, when dry, a mass easily friable, and rather shiny; it dissolves very copiously in water; the aqueous solution is decomposed by carbonic acid, with the deposition of unchanged Chinova-bitter.

All salts of Chinova-bitter possess a very bitter taste, fuse, when heated with a spirit lamp, and are decomposed, developing copious vapours, of a peculiar odour and white colour. If a flame be brought in contact with the melting mass, the vapours easily ignite, and the mass is burnt completely, presenting a clear, full, red, strongly sooty flame, the metals or oxides remaining behind. The combination of the oxide of silver with Chinova-bitter, which can be easily obtained by the decomposition of the neutral ammonia salt, by nitrate of silver, in the form of a white gelatinous precipitate, will dry up (even if the access of air be carefully prevented) into a blackish-grey, or nearly black, amorphous, easily friable mass. 0.2 grammes of the dry silver compound, after being burnt, left behind, according to these experiments (the results of which correspond very well with each other), at an average 0.042 grammes of silver = .0043659 grammes of oxide of silver. The per-centage composition, therefore, of the compound is,

78.1705 Chinova-bitter.
21.8295 Oxide of silver.

100.

Another result had been previously obtained by the analysis of the compound of silver, which I had procured by means of nitrate of silver from a basic fluid, prepared by boiling a mixture of lime, Chinova-bitter, and water. 0.315 grammes of this compound left behind, after being burnt, 0.145 grammes of silver = 0.1507 grammes of oxide of silver, which corresponds with the per centage composition of

52.1517 Chinova-bitter.
47.8413 Oxide of silver.

100. This compound is therefore a basic one.

The above may suffice as a contribution to the more accurate chemical knowledge of the Chinova-bitter. It remains to be elucidated in what relation Chinova-bitter stands to Chinova acid (Pelletier and Caventou). I have, in operating on large quantities of China nova, endeavoured in vain to find this acid, which, according to the opinion of the above chemists, does not precipitate salts of the oxides of iron, copper, or silver. In my former communications on the composition of this bark, I have stated them on the authority of Pelletier and Caventou, my attention having been particularly directed towards the Chinova-bitter. On this account I reserve to myself a repetition of the qualitative and quantitative analysis of the China nova; but according to what I have hitherto observed about the chemical relation of the Chinova-bitter, I might now rather designate it by the name of Chinova-bitter acid. A confirmation of the different statements on the

composition of Chinova-bitter of Messrs. Buchner and Petersen may be soon looked for, as Professor Wöhler, of Göttingen, is causing the elementary analysis to be repeated, and there can be no doubt that the results will be duly published.—(*Pharm. Central-Blatt, Sept.* 17, 1842).

[The red bark, known in France as *Quinquina nova*, and in Germany as *China nova*, is the produce of *Cinchona oblongifolia*. It is very different from the red bark of English commerce, though the London college has confounded them together, and ascribed our red bark to the tree which yields Quinquina nova, and which is sometimes called *Mutis's Red Cinchona of Santa Fé.*—Ed. Pharm. Jour.]

ON HUICHUNCHILLY.

The plant which yields *Huichunchilly* is, according to Dr. Martius, the Ionidium Marcucci Hooker, called in the Mexican language, Kuitschundschulji, and already mentioned, described, and figured in Feuillées Jour. des Observ., t. iii., b., p. 41. Paris, 1725. The Jesuit Velasco, at Quito, mentioned the plant and its medicinal properties, first in a MS. history of Quito, which came subsequently into the hands of Carea, the vice-president of the republic Ecuador. The latter caused the notice relating to it to be published, which first induced Dr. Aracha, of Maracaybo, to make experiments with it, and subsequently (1834), M. Marcucci undertook a journey to the place where this plant grows. After many fruitless enquiries, he found ultimately, that the plant grows only on the foot of Chimborazo, and was best to be had at Riobamba, where he obtained a small supply. He sent specimens, with remarks thereon, to Bancroft, at Kingston, in Jamaica, which were published by the latter in the Physical Journal of Jamaica. Sir W. Hooker, in 1836, determined the nature of the plant, from specimens obtained by Marcucci, and gave it the above name. It is identical with the small-leaved Ionidium, which had been described by Humboldt, from Columbian specimens, by M. Hilaire from Brazilian specimens, of which there are also specimens at Glasgow, obtained from North Chili (there called Paytensillo), and according to Caranilles, it grows also in Montevideo. It appears, therefore, that the plant is rather extensively distributed, which would seem to contradict the assertion, that the Chimborazo plant alone produces any effect.—(*Pharm. Central-Blalt, Sept.* 17, 1842.)

[The root of the *Ionidium mycrophyllum*, called *Cuichuncully*, has been recommended by Dr. Bancroft (Hooker's *Companion to the Botanical Magazine* vol. i., p. 278), in that most intractable disease called Elephantiasis tuberculata. It is probable, however, that its properties are similar to the *false Brazilian Ipecacuanha* (*Ionidium Ipecacuanha*), and that for both of these, the root of our own indigenous sweet violet (*Viola odorata*) might be substituted, as they all belong to the same natural family, *Violaceæ*. — Ed. Pharm. Jour.]

FLUID OF SPINA BIFIDA.

Landerer describes this fluid, obtained by puncture, as being of the specific gravity of 1.005 ; clear, without smell, very slightly alkaline, frothing, and depositing during boiling (accompanied by some slight developing of ammonia) some flakes. He found the following substances in it : albumen, chloride of sodium, chloride of calcium, chloride of magnesium, and traces of phosphate of soda and ammonia.—(*Pharm. Central-Blatt, Sept.* 24, 1842.)

DETECTION OF THE PRESENCE OF POTATO STARCH IN THE POWDER OF RICE OR ARROW-ROOT, BY MEANS OF DILUTED HYDROCHLORIC ACID.

BY M. SCHARLING.

If powdered rice or potato starch be mixed with concentrated hydrochloric acid, in the proportion of about one part of the former to one and a half or two parts of the acid, they form almost immediately a thick mucilage. The mucilage of potato-starch is nearly transparent; that of the rice, on the contrary, is opaque. They both emit the odour of formic acid.

If a mixture of hydrochloric acid and water be used, a very different action is exercised on the two substances already named. The potato-starch forms, in a very short time, a mucilage so thick, that the mortar may be lifted up by means of the pestle used in making the mixture; while the powdered rice does not acquire a similar viscosity in less than twenty-five or thirty minutes. If the rice-powder contains from four to six per cent. of potato-starch, it is easy to detect the admixture by means of this re-agent. For this purpose, a mixture of equal parts of hydrochloric acid of commerce and water should be used.

Arrow-root comports itself in the same manner as rice-powder, with the hydrochloric acid, while wheat-starch resembles potato-starch in this respect.

M. Marezeau, as is known, has proposed hydrochloric acid as a means of detecting potato-starch in flour, by the strong smell of formic acid which it developes in contact with the acid; but as the same effect is produced, in this respect, with rice-powder and arrow-root as with potato-starch, the hydrochloric acid cannot be used in this way for detecting the admixture of these latter.—*Annalen der Chemie und Pharmacie.*

REVIEWS.

Chemical Manipulation. By Michael Faraday, D.C.L., F.R.S., M.R.I. Third Edition. *John Murray, Albemarle Street.*

Having already reviewed this work (see vol. i, page 222) we shall condense our remarks on the third edition into a small compass. It would indeed be superfluous to analyze in an elaborate manner a work which all our readers ought to possess, and which should precede and accompany the study of the Pharmacopœia. The correct performance of every operation in Pharmacy being dependent upon manipulation, the importance of learning the principles of this art in a scientific and methodical manner must be self-evident to all who are engaged in such occupations. Professor Faraday observes,

"The person who could devise only, without knowing how to perform, would not be able to extend his knowledge far, or make it useful; and where the doubts or questions that arise in the mind are best answered by the result of an experiment, whatever enables the philosopher to perform the experiment in the simplest, quickest, and most correct manner, cannot but be esteemed by him of the utmost value. It is, indeed, to him like the external senses to the mind—a channel of information by which things before unperceived are made known, and like them it has its continual use."

Although these observations are made chiefly with reference to experimental researches, they are applicable to all the ordinary manipulations of the dispensing Chemist. It not unfrequently

happens, that incompatible substances are ordered in prescriptions, and the Chemist incurs censure when the ingredients of a mixture appear to be imperfectly combined, or the result is different from what was contemplated by the prescriber. But it would be presumptuous to offer an opinion on the subject, or to plead as an extenuation the impossibility of obtaining a more satisfactory result, unless the party possess a complete practical knowledge of the manipulations of his business, since there are many combinations which may be effected by the application of such experience, which in the hand of a clumsy operator would appear impracticable. When the principles of the art are thoroughly understood, the difficulty in a great measure vanishes, and the Chemist is enabled at once to decide upon the best means of effecting the desired combination, or abandoning the attempt if it be evidently fruitless.

In the work under consideration are described, the conveniences and requisites of a laboratory; general chemical apparatus and its uses; the methods of performing chemical operations; the facilities acquired by practice; and the causes which make experiments fail or succeed.

The great value of Professor Faraday's instructions consists in the economy of the means which he recommends. Most other works on chemical manipulation are written for the purpose of advertising apparatus; and some of them are little more than catalogues of implements, which involve a considerable amount of expense. But Professor Faraday writes for the benefit of those whose means do not admit of the furnishing of a complete laboratory, and while he gives ample directions for this purpose, he also enumerates a variety of expedients by which the desired objects may be accomplished at a trifling expense. On this account we have no hesitation in saying, that the Pharmaceutical student would save much more than the price of the work during the first six months of that practical research which he ought to prosecute during his apprenticeship.

Observations on a new Preparation of Iron, designated Aqua Chalybeata. By Bewley and Evans. *Dublin: Webb and Chapman.*

The preparation described in this pamphlet is an effervescing solution of *citrate of iron*, flavoured with orange-peel. It is put up in six ounce bottles, which contain thirteen grains of the citrate, and the dose is a wine-glassful twice or three times daily. The bottles are fastened over with a metallic cap, which firmly embraces the neck (an ingenious contrivance), and the beverage might, from its appearance, be called "Chalybeate Champagne."

The properties of citrate of iron have been extensively tested, and the addition of the carbonic acid and flavouring makes it a very agreeable medicine.

THE GREAT PHYSICIAN: THE CONNECTION OF DISEASES AND REMEDIES WITH THE TRUTHS OF REVELATION. By JOHN GARDNER, Surgeon. 1 vol. 8vo, pp. 366. *Hatchard and Son.*

"The chief design of this work," says the author in his Preface, "is the development of an idea that the phenomena and laws of diseases, and the power and action of remedies, have an intimate connection with the truths of revelation."

The author starts with the assumption of the truth of revelation, and first studies in the Scripture its account of the institution, nature, uses, and tendencies of diseases, and the designs of the Creator in the endowments of remedies. He then sketches, under this aspect, the evidences for the truths of revelation, the grounds and sanctions of natural theology, and shews the necessity for such a review in the construction of a Medico-Theology.

LITERARY AND SCIENTIFIC REGISTER AND ALMANACK, FOR 1843. By J. W. G. GUTCH, M.R.C.S. *London: Edward Lumley, 56, Chancery Lane.*

THIS is the most comprehensive and useful pocket-book which we have seen. If we were to enumerate all the topics embraced in it, our readers would scarcely believe that so much information could be condensed into so small a compass. We, therefore, only mention a few heads of the chapters:—Agriculture, Architecture, Chemistry, Domestic Economy, List of Exhibitions, Geography, Geology, Medical Formulæ in great variety, Mathematics, Miscellaneous Recipes, Painting, Statistics, Societies in London, Tables, Therapeutics, Zoology, &c. &c. &c., with blank sheets for Memoranda. The whole is comprised in a small pocket-book, 5 inches by 3. Price 3*s.* 6*d.*

FOOD, AND ITS INFLUENCE ON HEALTH AND DISEASE. By MATTHEW TRUMAN*, M.D. *London: John Murray, Albemarle Street.*

THE subject of this work is one which possesses universal interest, more particularly since the recent continental researches have given rise to so much discussion in this country on the elementary constituents of food. Dr. Truman's work is written in a popular style, and although he enters a little into the chemistry of the subject, he dwells chiefly on the general properties of different kinds of food, the manner in which they are usually prepared, and the adaptation of various nutriments to circumstances of constitution, climate, the state of the health, &c.

The following Works have been received in Exchange:—Journal de Pharmacie, Paris — American Journal of Pharmacy — Dr. James Johnson's Medico-Chirurgical Review—The Dublin Medical Journal—The Transactions of the Veterinary Medical Society—The Veterinarian—The Chemical Gazette—The Quarterly Journal of Meteorology—The Provincial Medical and Surgical Journal—The Medical Times.

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* ERRATUM. In our last number, *for* Freeman, *read* TRUMAN.

ERRATA AND ALTERATIONS IN THE LIST.

MEMBERS.

Beverley . . *read Bewdley.*
Burnsley . . *read Burnley.*
Devonport . Brooking, Samuel, Morrice Town, Associate, *read Member.*
Edinburgh . Anderson, Dunean S., 247, Canongate, *add* the *.
Evesham . Heron, Henry, *read Hiron, Henry.*
Harrowgate . Waite, William, *read Waite Joseph.*
Leeds . . . Ingur, Henry, *read Sagar, Henry*, 31, New Bond Street.
London . . Adams, Alfred, *read *Adams, Alfred*, 122, Piccadilly.
Bridge, Thomas, *a* 270, Regent Circus, *read Bridge, Thomas Andrew*, 270, *Regent Circus, Oxford Street.*
Hodgson, Charles James, 2, Park Lane, Piccadilly, *read* 60, *Strand.*
Hodgson, Philip Brown, 60, Strand, *read* 2, *Park Lane, Piccadilly.*
Howse, William, 16, Titehbourne Street, *add* the *.
Jeanes, Francis Henry, *read Jeans, Francis Henry*, 9, Broughton Place, Haekney Road.
Parsons, N., York Street, Westminster, *read Parsons, Robert*, York Street, Westminster.
Simmonds, Joseph, Lambeth Walk, *read Simmons, Joseph*, 38, *Lambeth Walk.*
Manchester . Breary, Wm. Arthur, *read Brearey, Wm. Arthur.*
Newcastle . *Burn, John Bell, 53, Northumberland Street, *read* * *Dunn, John Bell*, 31, *Westgate Street.*
Preston . . *Talbot, Thomas, North Road, *read* **Talbot, Thomas*, 50, *Friargate.*
Walsham, North } Blyth, Samuel Henry, *read Blyth, Samuel Harvey.*
Walsall . . Coverly, John, *read Coverley, John.*

ASSOCIATES.

Banbury. . Beesley, Thomas, with Mr. Beesley, *read Market Place.*
Barnsley. . Kershan, William, with Mr. Kershan, *read Kershaw, William, with Mr. S. Matchitt.*
Bath . . . Britten, William, *read Britton, William.*
Britten, James, *read Britton, James.*
Bolton . . Quinsey, John Chapman, *read Bury St. Edmunds.*
Quincey, James Chapman, with Mr. Dalton.
Bristol . . Ferris, Richard Andrew, Maryleport Street, *read with Ferris & Co.*
Ferris, Richard George E., ditto, *read ditto.*
Fendrick, Robert, *read Fendick, Robert.*
Bromwich . Wilkes, David, *read* BREEDON, *Wilkes, David.*
Cambridge . Foster, George, *read Foster, James*, with Mr. Watson, Pettybury.
Cheltenham. Hammond, James, *read Hammond, William.*
Chester . . Harrison, Edward, *read Harrison, Edwin.*
Cledon . . *read Cleveden.*
Devonport . Radford, Josiah, *read Radford, Isaiah C.*
Dorking . . Martin, James, with Mr. Cousins, *read with Mr. Ede.*
Dublin . . Hamilton, John Francis, *read Hamilton, John Travis.*
Sargent, Charles F., with Figgin & Holman, *read with Figgis & Oldham.*
Ealing . . Metealf, Tristram Walker, *read Metcalfe, Tristram Walker.*
Edinburgh . Fraser, Donald, *read Fraser, Ronald Bain*, with Mr. Lindsay.
Farnham . *Reeves, Walter William, *read* **Reeves, Walter Waters*, with Mr. Newnham.
Hitchin . . Humphrey, John, *read Pumphrey, John.*

Liverpool . Howarth, James, *read Howorth, James,* with Mr. Nuttall.
London . . Capper, Samuel James, 2, Trinity Row, Islington, *add* the *.
Dimoch, Henry, 95, Minories, *read Dymock, Henry.*
Eggington, Herbert, 116, Albany Street, *read* 168, *Piccadilly.*
* Franeis, George, 18, Thayer Street, *omit* the *.
Francis, George B., 338, Oxford Street, *add* the *.
Reece, John, 74, Westbourne Street, *read Rees, John.*
Taylor, John Thomas, 122, Pall Mall, *read Taylor, Thomas John.*
Ludlow . . Phillips, Robert, with Mr. Grounds, *read with Mr. J. E. Grieves.*
Luton . . Burgess, W. H., with Mr. Phillips, *read with Mr. Jordan.*
Maidstone . Bureham, Joseph, *read Barcham, Joseph.*
Manchester. Barker, Edward Nathan, with Mr. Howard, *read with Mr. Danson.*
Reay, Philip, *read Keay, Philip Henry, with Mr. Barker.*
Neweastle-on-Tyne. Procter, William, with Mr. Proeter, and Proeter, John, ditto, *read Proctor.*
Mann, Henry, *read Monro, Henry,* with Mr. Coleman.
Plymouth . Tracy, William, *read Tracey, William,* with Mr. Mennie.
Reading . . House, William Frank, *read Howse, William Frank.*
Redditch . Loudon, H., *read London, H.*
Rochester . Theobald, Peter, *read Theobald, Peter Bassett.*
St. Leonard's Betts, James Holman, *read* STAMFORD, *Betts, James Holman, with Neuzam and Althorp.*
Stoekport . Younghusband, William, with Mr. Taylor, *read Infirmary.*
Thirsk . . Talbraham, I. W., *read Tabraham, I. W.*
Tottenham . Bwye, G., *read * Bwye, George.*
Tunbridge . Willmer, Lewis M, *read Wibmer, Lewis M.*
Wellingboro' Donkell, James, *read Doubell, James.*
Worcester . Mould, Daniel, *read Mould, Samuel.*
York . . . Flower, John Gerrard, *read Flower, John Jerrard.*

TO CORRESPONDENTS.

We have received the following letter from Dr. Houlton :—

TO THE EDITOR OF THE PHARMACEUTICAL JOURNAL.

87 *Lisson Grove, October* 31*st*, 1842,

Sir,—I hope you will allow me to make a few remarks on some parts of your number for September. This I eonsider I have a right to expect, as my avowed, and also suspected sentiments, have been therein commented upon. In the first place, Dr. Pereira states that he gathers from a paper of mine, that I suspeet the annual and biennial hyoscyamus to be distinct species, which suspicion he thinks right to controvert. The subjeet of variation, Dr. Pereira knows, is one of difficulty and great delicacy, and no exact botanist would like to have his unpublished opinions on points of this kind made a subject of public discussion. Dr. Pereira might as easily have gathered a suspected opinion from my paper, an opinion which I have not at present published, but which, if confirmed, will be found to differ from any that appear on the subject of hyoscyamus in Dr. Pereira's Materia Medica.

You, Sir, have thought right to make some additions to my communication on Colchieum Autumnale ; these additions, I consider, do materially deteriorate my paper and figure, and tend to mislead your readers. I was not a little surprised to see the manner in which the communication appeared on the pages of your Journal, especially as the cut on the block and the proof of the letter-press had been submitted to my inspection previously to publication ; and when the drawing was exhibited, and the paper

read at the meeting in August, no such additions then appeared.* Such treatment I did not expect to have received, and I do not think it is calculated to increase the number of your contributors upon the subject of medical botany, which,

"Like the fair flower, expands its lucid form,
To meet the sun, but shuts it to the storm."

I am, Sir, your obedient Servant, JOSEPH HOULTON.

* [On the 10th of August, two days *after the paper was read*, we received a letter from Dr. Houlton, in which the following sentence occurs :—"Please to look over the proofs, and make any verbal alterations you deem proper." Accordingly we added the notes (signed ED.), page 129, and the cormus (Fig. 2) in the plate, page 130, in further elucidation of the subject. ED.]

"AN ASSOCIATE" (Nottingham). Ergot of Rye may generally be kept, for a year or two, in a sound state, without any further precaution than keeping it quite dry, and secured in a stoppered bottle. If exposed to damp, it is attacked by a small acarus, which destroys the interior of the ergot, and produces much powdery excrementitious matter. When, in this state, it is unfit for use. It is much more liable to deterioration when in powder.

The medicinal properties of Spiritus Etheris Nitrici are certainly impaired when it has acquired much acidity ; and, probably, the presence of nitrate of potash, formed by neutralizing the acid with bicarbonate of potash, would be less objectionable than the free acid. It ought not to be used at all when the change has taken place to any great extent.

R. L. F. inquires, "When confectio aromatica is ordered in a prescription, should the powdered ingredients be weighed without mixing them first with water or not ?" We cannot understand the directions of the present Pharmacopœia on this point, but consider it right to use the aromatic confection as formerly ordered.

J. S. (Corsham) inquires, Whether, in preparing *seratum saponis*, a proportionate quantity of acetate of lead might with propriety be substituted for the oxide of lead and vinegar, which the Pharmacopœia orders in the proportions to form acetate of lead ?—We think *not*. The only allowable deviations from the instructions of the Pharmacopœia are those which occasion no difference in the product. In this case the product would be entirely different in colour ; and although its medicinal effects may be the same, yet a patient, having a prescription dispensed at one house with the brown cerate, made strictly according to the Pharmacopœia, and at another house with the white cerate, made with acetate of lead, would probably apprehend a material difference.

C. T., A.P.S. (Liverpool). Tinctures should always be macerated for the time specified in the Pharmacopœia, and the whole then strained. The practice of keeping tincture of opium on the dregs, and straining off small quantities as required, is decidedly objectionable. The instructions of the Pharmacopœia cannot, with propriety, be deviated from in any case, excepting where the results would be the same ; and as we believe that some change is effected in the opium, in drying it, hard opium should be used as directed. The Pharmacopœia defines the quantity of spirit to be added to the opium, not the quantity of tincture to be obtained after straining.

"WILLIAM," A.P.S.—Hydrosulphuric acid is another name for sulphuretted hydrogen. It is obtained by acting on sesquisulphuret of antimony, or sulphuret of iron, with hydrochloric acid.

"A CORRESPONDENT" (West Bromwich) has sent us a sample of a salt which, he says, was sold by a Chemist for ammonio-chloride of iron. It possesses none of the characters of that substance, and appears to be hydrochlorate of ammonia, bruised, and slightly tinged, probably, with tincture of sesquichloride of iron.

"A Correspondent" at Nottingham, informs us that a dealer in cream of tartar called on him a short time ago to inquire the effect of plaster of Paris on the system, as he had sold a quantity of cream of tartar at a price at which it was impossible to furnish it genuine, and which did not admit of its adulteration with so expensive a substance as alum.

"Prudentia."—When elder-flower water is distilled, a very minute quantity of an oily substance may be seen floating on the surface. "Prudentia" is referred to page 219, vol. i.

W. W. M.—Potassæ tartras is not commonly prepared in crystals by manufacturers. There is a fine specimen in the museum of the Society, presented by Messrs. Howard and Co., of Stratford.

L. E. Y., A.P.S.—The Council has not yet instituted an examination for honours.

Blacket's *Saturated Tincture of Belladonna* is made by macerating ʒx. of extract of belladonna in lbj. of proof spirits, and straining. The dose of this is ♏ ij. or ♏ iij, gradually increased. ʒj. added to ℥viij. of liquid has been used as a lotion.

S.T.K.—The following is the formula for Basilic powder :—

℞ Hydrargyri Chloridi.
Oxidi Antimonii loti. (calx)
Potassæ bitartratis.
Pulveris Scammonii, aa partes æquales.

"A Member" (Plymouth).—The following is said to be the original recipe, published by Dr. Armstrong, for Black Drop :—

Take of Opium lbss.
Good Verjuice Oiij.
Nutmegs ℥iss.
Saffron ℥ss.

Boil to a proper thickness, then add two spoonfuls of yeast, set the whole in a warm place near the fire, for six or eight weeks, then in the open air, till it becomes (the consistence of) a syrup, when it is to be decanted, filtered, and bottled up, with a little sugar added to each bottle; one drop equals three of tincture of opium. [This is the only recipe which we have seen published, with any pretensions to authority, but the directions are not sufficiently explicit to ensure uniformity in the result].

M. P. S., Hull. The following is the recipe for Lapis Divinus :—

Take Sulphate of copper
Nitrate of potash
Alum, each 3 oz., powder separately, mix well together, fuse, then add finely powdered camphor 1½ dr., run into moulds, or suffer it to cool, and break in small pieces.

R. M. M., A. P. S. recommends the following as a mode of preserving leeches in health :—Wash them every morning with soft water, then put them in an empty jar for a few hours, after which half fill the jar with soft water. [We have found it useful to keep a large piece of sponge in the jar with leeches.—Ed.]

Mr. Proctor, and G. B. have sent us the following quotation from Dr. Black's work respecting Nitrate of Silver : "It is the most powerful antiseptic known. One ounce of it dissolved in 12,000 ounces of water will preserve the water from putrefaction for ever, and it may at any time be separated therefrom by adding a small lump of common salt," vol. ii. p. 661. Dr. Paris, in his Pharmacologia, observes, "This is a curious fact, but the experiment is too hazardous to be recommended."

E. A.—The best solvent for Caoutchouc, where an unpleasant smell is to be avoided, is pure æther. The solubility of the caoutchouc may be increased by previous maceration in solution of ammonia.

A "COUNTRY ASSOCIATE."—Fermentation is a necessary process in making cyder. We recommend Sir Humphrey Davy's work on Agricultural Chemistry

"AN ASSOCIATE." W. M. (Boston). We have no evidence of the fact, that *water*, with a *spare diet*, tends to make people stout. It is not probable that the elements of water are assimilated in the formation of fat.

W. W. ("A CHEMIST AND DRUGGIST").—We know of no chemical agency practically available, by which thick flint glass might be decomposed, so as to obtain perforations of determinate dimensions through it.

Mr. JAMES HAWORTH inquires, What is the best work for an operative Chemist?—*Aikin's Dictionary* is the best work with which we are acquainted, but it is unfortunately out of print. M. Dumas's *Traité de Chimie* is a good work.

"Φαρμακευς" suggests the propriety of establishing meetings of Members and Associates of the Society in large towns, for the purpose of discussing scientific subjects. We think this highly desirable whenever it can be accomplished.

"Junius" inquires, Whether we recommend the "*Annals of Chemistry and Practical Pharmacy*," or the "*Chemical Gazette?*" The expense of the former is 8*d.* a week, and the latter 1*s.* a month. If our correspondent can afford it, we should advise him to take in both.

M.P.S. (Hull)—Some of the best specimens which we have seen of the skeletons of flowers, leaves, capsules, &c., were prepared by simple maceration in water, cleansing by means of a syringe, and bleaching with chloride of lime.

X. Y. Z. (Fakenham) must send *his name* to the Secretary, with his instructions respecting the Journal.—*See* the Manual of Heliography. London, 1840.—*See* No. ii. Vol. ii. page 367, line 4. By adding liquor ammoniæ to a solution of alum, alumina is thrown down. We believe the retail price is about 2*s.* an ounce. We are unable to state the price of cylinders for electrical machines, but advise X. Y. Z. to apply to the Glass-houses.

We have received letters from M. P. S., Mr. Hallows, D. G., and many others on the closing of shops. This subject has had our most mature consideration, not only at the present time, but also long before the establishment of the PHARMACEUTICAL SOCIETY. The facts mentioned by several of our correspondents tend to confirm the opinion which we had previously formed, from observation and experience, namely, that the question is one of extreme difficulty.—*See* page 411.

"AMICUS" (Kent)—The prohibition against pirating the Diploma of the Society is general, admitting of no exception.

Advertisements to be addressed to Mr. CHURCHILL, Princes Street, Soho.

Other Communications to THE EDITOR, 338, Oxford Street (before the 20th of the month, if answers be desired in the ensuing number).

PHARMACEUTICAL JOURNAL.

VOL. II.—No. VII.—JANUARY 1st, 1843.

THE PHARMACEUTICAL MEETINGS.

When the charm of novelty, and the stimulus of fashion have ceased to exert their influence in propping up a new institution, it naturally falls back upon its own intrinsic merits, which must determine its fate. If it stand the test of this ordeal—if the importance of its objects and the benefit of its results have become manifest, it gradually acquires a degree of stability which is the prelude to permanent success. It is too often the case with new societies that the members gradually relax in their zeal, the supporters one by one fall off, and that which commenced with a blaze ends in smoke. It is therefore incumbent upon those who found an institution, or establish any course of proceeding from which a lasting benefit is desired, to guard against the reaction which, in the common course of events, might be expected to supervene, and by renewed energy to secure a continuance of prosperity.

The spirit with which the Pharmaceutical Meetings have hitherto been kept up, affords every encouragement to perseverance; and those who have regularly attended them, must have remarked a degree of uniformity in their course, which could scarcely have been anticipated when all the circumstances of the case are considered. But we are addressing ourselves more particularly to those who have not attended the meetings, or who have so seldom been present as to be unable to estimate the pro-

gress which has been made, or even to appreciate the advantages likely to result from scientific discussions of this nature.

The subjects which generally claim the attention of the Society on these occasions, are those which are calculated to elicit practical information, and to lead to improvements in the processes daily employed by the Pharmaceutical Chemist. We have, until lately, enjoyed no opportunity of comparing our ideas on these subjects; we have had but little scientific intercourse with each other; and while every other branch of the medical profession has been provided with an arena in which new facts could be promulgated, and new theories discussed, the Pharmaceutical Chemists have left their province in the hands of others, and neglected those means which might have enabled them to improve their position in the profession, and keep pace with the advancement which has been making around them.

The Pharmacopœia is the text-book of the Chemist and Druggist, he is supposed to be familiar with every process which it directs, his daily experience enables him to estimate and compare the advantages or difficulties attending the various methods of manipulation, and yet he is scarcely allowed the privilege of suggesting an alteration—he is merely required to obey the instructions which are sanctioned by law. It is not to be supposed that the members of the College of Physicians are ambitious of conducting pharmaceutical researches, and prosecuting chemical experiments; their object is to ensure the correct preparation of remedies, and to exercise such a superintendence as is necessary for this purpose. The members of the College of Surgeons, in their collective capacity, renounce the practice of pharmacy altogether; the Apothecaries are sometimes consulted, but are not, *ex officio*, concerned in the matter. The Chemists, *on account of their apathy and indifference*, have been overlooked and disregarded. They have only themselves to thank for this moral degradation. When any allusion is made to their qualifications and the necessity of a definite amount of education in all who practice

Pharmacy, they exclaim loudly against restrictions, and energetically uphold the rights and privileges of "the trade;" but forget, or fail to adopt, the correct and legitimate means of defence — namely, the intellectual improvement of their own body.

This, at least, *has been* the case up to the period at which a decided step was taken to introduce a reformation, and which has been justly considered an era in the history of Pharmacy. The work is now progressing; and among the measures which have been devised for attaining the desired result, the Pharmaceutical Meetings deserve particular attention.

These meetings have tended materially to diminish the distrust and jealousy of the medical profession, to promote harmony among the Members of the Society, and to divert the minds of all parties from that spirit of contention and controversy which is calculated rather to perpetuate than to remove existing abuses. It was not to be expected that our own Members would immediately, on the institution of such proceedings, astonish the scientific world with a succession of brilliant discoveries, or give birth to a profusion of philosophical communications; the advance which we have made has been quite as rapid as could have been expected, and our past experience ought to encourage us to persevere with fresh zeal and industry.

We have already received many useful and practical papers from among our own body, and also valuable contributions from our honorary members and other scientific friends, which have given rise to spirited discussion, as well as correspondence in the Journal. If some of these papers have been rather abstruse, and in advance of the majority of the audience, others have related to many of the most simple operations in Pharmacy, with which every one is familiar; and it is by this union of the two classes of communications in each meeting, that the Committee have endeavoured to uphold the scientific character of the Institution, and at the same time to fix the attention and excite the interest of the members.

It would be a great advantage if we could always have a stock of papers in hand, so as to be able to announce before each meeting the subjects which will be discussed. By this means we might often ensure the attendance on each particular occasion of those who would be likely respectively to give or receive the desired information.

We hope our members in general will endeavour to support the exertions of the Committee by furnishing a succession of practical papers, and also by attending and assisting at the discussion at the Pharmaceutical Meetings; recollecting that on these occasions we have the opportunity of demonstrating to the medical profession, that the practical experience of our members may be essentially useful in advancing the progress of Pharmacy, and thus indirectly improving our Pharmacopœia.

It not unfrequently happens, that the remarks which follow a paper are quite as instructive as the paper itself, it having been probably the chief object of the author to introduce a subject on which the opinion of the Members of the society was desired. In fact, whenever a doubt exists with respect to a scientific question in our department, a Pharmaceutical Meeting is the legitimate tribunal to which reference should be made. The professional character of our body is at stake in the result of such discussions, and it is therefore of the highest importance that those Members who are most qualified by their experience to give a sound opinion, should consider it their duty to support the prerogative to which we lay claim, as ARBITERS in all matters relating to PRACTICAL PHARMACY.

The advantages to be derived from the LECTURES and EXAMINATIONS instituted by the society, are in some degree prospective, and consist in the gradual improvement of the rising generation; but THE PHARMACEUTICAL MEETINGS are calculated to have a direct and immediate influence in raising the character and position of our body, and therefore claim the especial support and encouragement of all our MEMBERS.

TRANSACTIONS
OF
THE PHARMACEUTICAL SOCIETY.

LECTURE
ON VEGETABLE POISONS,

DELIVERED NOVEMBER 30th, 1842,

BY R. H. SEMPLE, ESQ.

When I last had the honour of addressing the Members of this Society I stated, that the vegetable kingdom, besides contributing a variety of products which conduce to the happiness and comfort of mankind, yielded some of the most deadly poisons with which we are acquainted. I also stated, that the tribes of plants in which these poisonous properties exist, are distinguished by certain characteristic features, by which they are readily discriminated from those forms of vegetation which possess nutritious principles, or which are merely inert; and that the knowledge of the external forms of plants, in connexion with their sensible properties, constituted what is called the "Natural System of Botany." Let it not be supposed, however, that I consider this celebrated system as absolutely perfect; for it is true, that many very weighty objections may be urged against it, as it now exists: but it must be admitted by all, that it is the most philosophical attempt which has yet been made to reduce the multitudinous forms of vegetable life within the limits of scientific arrangement, and that its present imperfection is rather owing to the intrinsic difficulty of the subject, than to any want of skill or assiduity on the part of those who constructed it.

Having on the last occasion pointed out to you some of the leading properties of prussic acid, I propose to commence the present lecture with an examination of a substance of far greater importance as a medicine, and hardly less formidable as a poison —namely, opium.

The natural order of Papaveraceæ, to which the poppy belongs, contains only one species in which the narcotic principle exists, at least to such an extent as to become interesting to the chemist, the physician, and the toxicologist. The plants of this order present the exogenous structure, but they seldom attain the dimensions of trees; they all abound in a milky juice, which, in the case of the Papaver somniferum, concretes into opium. The

leaves are alternate; the calyx consists of two deciduous sepals; the corolla is composed of four petals, though this number is not constant; the stamens are numerous, inserted into the receptacle; the ovary is solitary; the fruit is one-celled; the seeds are numerous, and the embryo is surrounded by albumen.

The Papaver somniferum, or white poppy, exhibits all the characters of the order to which it belongs; and it is farther distinguished by the following circumstances: the leaves are smooth, of a bright green colour, embracing the stem, and deeply cut at the edges; the petals are four in number, of a white colour, with a purple spot at the base of each; the ovarium is globular and smooth. The fruit, when ripe, presents the appearance of a one-celled capsule, though it is, in fact, composed of a number of carpels, the dissepiments of which have been ruptured in the progress of their development, and remain in the form of plates attached to the circumference of the seed-vessel. The seeds, which are very numerous, are attached to these plates, called *parietal placentæ*, because they are adherent to the *parietes* or *walls* of the capsule; and *placentæ*, because, like the organs of the same name in the animal kingdom, they give nourishment to the embryo of the future being.

The white poppy is indigenous to the east, and is very extensively cultivated in Turkey, Persia, and the East Indies; but it has also become naturalized in many parts of the south of Europe, and is cultivated even in Great Britain, not only as an ornament to our gardens, but also for the purpose of obtaining opium. It is a remarkable fact, that although the narcotic principle abounds in nearly all parts of this plant, the seeds are wholly destitute of any deleterious property; they contain a bland and innocuous oil, which is extensively employed on the continent as a substitute for olive oil, and is an article of general consumption.

The common red poppy of this country, the *Papaver rhœas**, probably contains some principles analogous to those found in opium, but if they exist at all, they are in a very diluted state. The petals are employed in the preparation of the *syrupus rhœados* of the Pharmacopœia; but they are simply used as a colouring matter, and are wholly destitute of activity.

The capsules of the *Papaver somniferum* are employed in the preparation of the *syrupus papaveris albi*, which possesses the properties of opium, though in a diluted form. This syrup is sometimes prepared by druggists by adding laudanum to treacle —a most dangerous and reprehensible practice, because, as I shall presently show, very small doses of laudanum have often

* Dr. Christison, in his Dispensatory, states, that a substance analogous to opium may be obtained from P. rhœas, P. dubium, and P. bracteatum.

proved fatal to infants, for whom the syrup of white poppies is frequently prescribed.

Opium, from the Greek word *οπος, juice*, is the inspissated juice of the white poppy, and appears to have been known from a very early period, as it is mentioned and recommended by Hippocrates. It is procured from the half ripe capsules of the poppy in the following manner: A few days after the flower has fallen, the men and women of the country where it grows make an incision into the capsule with a sharp instrument, without, however, penetrating the interior cavity. The incisions are repeated every evening until each capsule has received six or eight wounds. The juice which exudes is collected by the peasants and their children, who scrape it off the wounds with an iron scoop; it is then made to thicken, by working it with wooden spatulas in the heat of the sun, and is made into cakes for sale; it is afterwards enveloped in dry leaves, and then sold.

Five kinds of opium are stated by Dr. Pereira to be met with in English commerce, namely, Smyrna, Constantinople, Egyptian, Trebizond, and English opium. The Smyrna or Turkey opium is that which is most generally met with in this country; Indian opium, although procured in enormous quantities in Hindostan, does not find its way to the English market.†

Opium has a reddish-brown colour, and its fresh surface glistens when cut; its smell is strong, and very peculiar; its taste is also peculiar, very bitter, and somewhat acrid. When held over a flame, it takes fire, and burns without producing any narcotic odour. It dissolves in water and in alcohol.

The tincture of opium is ordered to be prepared with proof spirit; but in a small edition of the last Pharmacopœia, which I have before me, rectified spirit is directed to be employed, which is evidently a mistake.

Chemical analysis has proved that opium is composed of a number of substances, of greater or less activity, some acid, some alkaline, and others presenting only neutral characters. The principal substances deserving especial notice are the following:

Morphia, meconic acid, narcotine, codeia, narceia, meconin, gum, resin, lignin, and extractive matter.

Morphia appears to be the active principle of opium. This alkaloid is a substance of great interest to the Pharmacologist, both for its chemical relations and for its medicinal and poisonous powers. It was described by a Chemist named Sertuerner in

† It is preferred to all other kinds in China for smoking. Before the late seizure at Canton, the sales in China alone had rapidly risen to the amount of 3,000,000 of pounds avoirdupois, which were worth as many pounds sterling.

1816; and his investigations led to the discovery of a series of similar principles occurring in the products of the vegetable kingdom, until the important truth became almost universally established, that the active properties of plants, whether poisonous or medicinal, reside in certain alkaline substances peculiar to each genus. It is almost needless to expatiate upon the benefits which have accrued to medical science from these discoveries: a few grains of an alkaloid can be given with much greater effect, and with far more comfort to the patient, than a large quantity of a decoction or infusion, or of the vegetable matter in the solid state. Thus a grain or two of sulphate of quina is more efficacious than an ounce of decoction of bark; the use of hellebore is superseded by that of veratria; that of monk's-hood, by aconitina; that of the nux vomica, by strychnia; that of belladonna and ipecacuanha, might probably be replaced by the employment of atropia and emetina. It cannot be said, however, that morphia can be considered a substitute for opium; for although the virtues of this substance have been extolled by many, it is probable, as I shall mention hereafter, that it hardly deserves all the eulogiums which have been bestowed upon it. The principal tests of morphia are the following;—

1. Nitric acid, dropped upon morphia, or any of its salts, with the exception of the chlorate, produces an orange red colour. If a weak solution of morphia be employed, this change is not discernible; and this test cannot be relied upon, because emetina, brucia, and impure strychnia are affected in a similar manner. The nature of the chemical change which takes place is very imperfectly understood.

2. Perchloride of iron gives a blue colour with a concentrated solution of morphia; but if a weak solution be employed, the change is not very apparent. In this case, also, the nature of the chemical operation is not well understood.

3. Iodic acid forms with morphia a solution of a reddish-brown colour, owing to the decomposition of the acid, and the development of free iodine, which may be further recognised by the blue colour produced on the addition of starch.

Morphia possesses most of the properties of opium, acting as a sedative and anodyne in moderate doses, and in large doses as a poison. It is supposed by many that it produces the soothing effects of opium, without the excitement and other disagreeable symptoms which sometimes follow it. This view, however, of its operation is questioned by some medical practitioners; and as far as my experience goes, I may state, that I have seldom found it to possess any advantages over opium itself; and, in one or two cases, its administration has given rise to so much irritation and disturbance of the system, that I was obliged to discontinue its use.

That the effects of opium are not entirely owing to the presence of morphia is, I think, conclusively proved by the following fact; opium yields on the average about 10 per cent. of morphia, and it should therefore follow, if morphia were the active ingredient, that the alkaloid is ten times more powerful than the opium itself; but it is found in practice that half a grain of morphia produces only those effects which might be produced by about two grains of opium. What the other active principles really are it is not easy to determine: for most of the other constituents of opium are either inert or possessed of feeble powers.

Meconic acid, so named from the Greek word μηκων, *a poppy*, exists in opium in combination with morphia. It may be prepared by passing a stream of sulphuretted hydrogen through the meconate of lead diffused in water. A precipitate of sulphuret of lead is produced, and the solution contains meconic acid, which is obtained in crystals by evaporation. The crystals thus produced appear in the form of white, transparent, micaceous scales. Meconic acid is distinguished by the following tests:— It gives a dark red colour with the persalts of iron, owing to the formation of permeconate of iron. This test, however, is not conclusive, because sulphocyanic acid, the saliva of man, and infusion of mustard, together with some other substances also redden the persalts of iron. Solutions of acetate of lead and of nitrate of silver, throw down precipitates of the meconate of lead and silver.

Meconic acid is inert. Sertuerner who proved its existence in opium and gave it its present name, swallowed five grains of it without producing any effect; and various experiments made upon different animals have led to the same result.

Narcotine is a constituent of opium distinguished rather for its negative than its positive properties. It is neither acid nor alkaline, and undergoes no change on the addition of the persalts of iron. It may be prepared by evaporating an aqueous infusion of opium to the consistence of an extract, and digesting it in sulphuric ether. This solvent, which does not act upon meconate of morphia, takes up all the narcotine, and deposits it in acicular crystals by evaporation.

The unpleasant stimulating properties of opium were attributed by Magendie and other physiologists, to the presence of narcotine, but subsequent investigations tend to prove, that when quite pure, narcotine is really inert.

The other constituents of opium, although important in their chemical relations, offer so few points of interest to the pharmacologist, that their description may be omitted.

The process to be employed for determining the presence of opium in suspected fluids, is extremely delicate and liable to

numerous fallacies. The object of it, however, is the detection of meconic acid, and the production of morphia in a free state. The following plan is recommended in Dr. Pereira's lectures: The stomach and duodenum, cut into small pieces, with their contents, are to be digested in distilled water, acidulated with acetic acid, and frequently stirring. The solution is then filtered. A few drops of some persalt of iron in solution are then added to one portion of the filtered liquid, when, if meconic acid be present, a red tint is produced. To another portion of the liquid, solution of starch is added, and then iodic acid, when iodide of starch is formed of a blue colour. A more elaborate process is recommended by Dr. Christison, but as its object is to procure morphia and meconic acid in the free state, and as I have already described the means of doing so, it is unnecessary to repeat it.

It must be admitted, however, that the powers of chemistry are often baffled in the search for opium in the contents of the stomach. It has already been stated, that unless the fluids be in a concentrated state, the characteristic tints are not distinctly seen, and when we reflect upon the heterogeneous substances which are often found in the stomach, as wine, porter, chocolate, coffee, &c., all of which are calculated to conceal the delicate shades of colour produced by the constituents of opium, the difficulty of the search must be obvious. But even if there be no opium whatever in the stomach, it must not be thence inferred that the person has not perished by poisoning with that substance; it may have been vomited or removed by the stomach-pump before death; or when no such evacuation has taken place, yet laudanum may be so quickly absorbed into the system, as to leave no trace of its existence in the stomach. In the case of a young woman who died in five hours after taking no less than two ounces of laudanum, Dr. Christison wholly failed in procuring any evidence of the presence of opium by the application of his own tests, and was able to trace its existence only by the taste of the contents of the stomach, which had the bitterness of morphia.

In cases, therefore, of suspected poisoning by opium or its preparations, not only should the chemical tests be carefully applied, but a minute enquiry should be made into all the attendant circumstances, such as the symptoms before death, the appearances after death, and the statements made by the patient.

Opium is a poison which, like prussic acid, does not appear to produce any local injury of the parts to which it is applied, but acts remotely upon the brain and nervous system, causing stupor, coma, and death. Whether it produces these effects by being absorbed into the current of the blood, or merely by sympathy along the nerves, is a question not yet satisfactorily

determined by physiologists, nor does it appear to be one of much practical importance.

Opium belongs to that class of poisons which are denominated *narcotic*, the effect of which is deep somnolency, terminating in death. It is a question of the greatest interest to determine how far the symptoms caused by narcotic poisoning are liable to be confounded with those produced by natural disease, as for instance, apoplexy; and although it is not my intention to occupy your time with the physiological and pathological distinctions which exist between them, yet I think it necessary to state that they resemble one another so closely that it is often hardly possible to discriminate them. This circumstance will appear the more obvious, when I mention that opium is actually productive of one form of apoplexy, namely, the congestive; and the most minute and scientific *post-mortem* examination is often insufficient to determine whether the appearances observed are due to apoplexy or narcotic poisoning.

In order to illustrate this part of the subject, I will relate a case which came under my notice a year or two ago, and which involved one of your own body in unnecessary anxiety.

A lady, between fifty and sixty years of age, who had long been in a declining state of health, sent her servant one night to the shop of the gentleman to whom I allude, for a composing draught, as she was troubled with a distressing cough; he gave her a draught, consisting of fifteen drops of Battley's Sedative Solution in camphor mixture*; she took this draught, and in the morning, as she felt herself much worse, a medical gentleman was sent for, who came and found her in the agonies of death, and shortly afterwards she expired. Without the knowledge of the Chemist, a *post-mortem* examination was made by the surgeon, and a coroner's jury was summoned, at which I was requested to attend as a friend of the accused party. The evidence of the surgeon, which was the only important feature of the case, tended to show that the deceased had died of narcotic poisoning, although this opinion was founded chiefly upon the *post-mortem* appearances. In vain I represented that so small a dose of the sedative solution could not induce narcotic poisoning, at least if a judgment might be formed by all past experience; and, moreover, that there existed no distinctive appearances whatever in the dead body to distinguish narcotic poisoning from congestive apoplexy. A verdict was returned that the deceased died of narcotic poisoning, although it was stated, at the same time, that no blame was fairly attributable to the Chemist. A week after this event, I examined the body of a

* Equivalent to twenty drops of laudanum.

young girl who retired to bed in perfect health, and was found dead the next morning; in this case it was proved, beyond the possibility of a doubt, that no poison had been swallowed; I found precisely the appearances that were described by the surgeon, as being distinctive of narcotic poisoning. As I felt, however, that my opinion would carry more weight if it were confirmed by a man of great celebrity, Dr. Christison was written to upon the subject, and his answer completely confirmed the opinion which I had orginally formed.*

The symptoms of poisoning by opium, when it is administered at once in a large dose, begin with giddiness and stupor. The stupor increases, the person soon becomes motionless and insensible to external impressions; he breathes slowly, generally lies quite still, with the eyes shut, and the pupils contracted. This last appearance, which is almost constantly seen in cases of poisoning by opium, is very characteristic, and the contraction has been in some cases so considerable that the pupils have been no larger than a pin's head. The state of the pulse varies, but it is generally feeble and irregular. As the poisoning advances, the features become ghastly, the pulse imperceptible, the muscles relaxed, and death calmly closes the scene. The state of insensibility caused by opium does not amount to what is called coma, in which there is a total loss of sensation, for the patient may be roused by loud speaking, agitation, tickling the nostrils with a feather; but after awaking from the state of torpor, he very soon relapses into insensibility. It is a remarkable fact, that opium excites convulsions when administered to the lower animals, but in the human subject this symptom is very rarely observed.

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* Copy of a Letter from Dr. Christison.

"SIR, *Edinburgh, July* 20, 1841.

"I HAVE just received your letter containing the Report of an Inquest held . . . . . and requesting my opinion as to the possibility of death having been occasioned by a dose of fifteen drops of Battley's Sedative Solution.

"In reply, I beg to refer you to the third edition of my book on Poisons, p. 657—where it is mentioned, that the smallest fatal dose of opium, of which I am cognizant, is four and a half grains, a much larger quantity than is contained in the dose in question. As to the particular preparation used, I may further state, that before the introduction of the muriate of morphia into medicine, I seldom used in my own practice any other preparation of opium than Battley's Solution; that I have never given less than twenty drops for a dose to an adult; and that I have not observed, in any instance, from that dose, any other than a salutary effect. I cannot conceive it possible, therefore, that fifteen drops of this preparation could occasion death in the case of ———, unless by arbitrarily assuming that her constitution was preternaturally susceptible of the action of opium, to an extent of which no instance has hitherto been put upon record. I am, your obedient Servant, (Signed) "R. CHRISTISON."

The ordinary duration of a fatal case of poisoning by opium is from seven to twelve hours. Most persons recover who survive twelve hours, but many die within the shorter period. Dr. Christison met with a case which was fatal in five hours; Dr. Home another, in which death ensued in four hours; and one case is recorded where it ensued in only three.

Opium acts upon all the lower animals as a poison, though its effects are different from those produced in man; and it is said that the stamina of the barberry and the leaves of the sensitive plant lose their contractility when the stems of those plants are immersed in a solution of opium.

The dose of opium necessary to cause death in the human subject has not been determined with certainty; and the utmost diversity of opinion seems to exist upon the subject among medical writers. Dr. Paris states, that four grains may cause death, a statement which is surely erroneous, notwithstanding the great celebrity of that author, for in medical practice three or four grains are often administered to patients without producing any effect, except a sound sleep. The smallest poisonous dose mentioned by Dr. Christison is four grains and a half, which, taken with nine grains of camphor, caused death in nine hours.

I wish particularly to direct your attention to the dangerous results which often ensue from the administration of opium to young children, in whom a few drops of laudanum may produce fatal consequences; and a knowledge of these effects may be useful in cautioning all persons who have the care of young children to avoid the practice, which is still too common, of giving opiate preparations to infants to lull them to sleep. I quote the following cases from Dr. Christison's work, and the daily newspapers furnish abundance of similar instances.

To an infant, three days old, was given, by mistake, the fourth part of a mixture containing ten drops of laudanum: the child died in twenty-four hours with all the symptoms of narcotic poisoning. A case is also related of a stout child, fourteen months old, who took only three drops of laudanum and died in six hours. Another case is related on the authority of Dr. Alison of Edinburgh, of a child, a few weeks old, who died with all the symptoms of poisoning by opium, after taking only four drops of laudanum.

I am so well convinced of the peculiar susceptibility of young children to the effects of this poison, that I never prescribe opium or laudanum at all to such subjects; and I believe that, except in some rare instances, this is the course pursued by the whole profession.

The effects of opium are diminished by habit, and opium-eaters are obliged to increase the dose of the drug in order to procure

the desired exhilaration. In some tedious and painful diseases, also, large quantities of opium are often swallowed daily, not only without injury, but with the effect of mitigating pain.

A question of considerable importance arose in 1831, involving the consideration, whether the practice of opium-eating really tended to shorten life, or to lay the foundation of disease. An action was brought by Sir W. Forbes & Co. against the Edinburgh Life Assurance Company. The late Earl of Mar effected insurances on his life to a large amount, while addicted to the vice of opium-eating, which was not made known at the time to the insurance company, and he died two years afterwards of jaundice and dropsy. The company refused payment on the ground that his lordship had concealed from them a habit which tends to shorten life; and Sir W. Forbes and Co.'s bank, who held the policy of insurance as security for money lent to the Earl, brought an action to recover payment. Dr. Christison was employed professionally in this action, and made a number of inquiries connected with the question at issue; the result of which was, that so far as he could observe, the practice of opium-eating did not materially tend to shorten life, and that an opium-eater's life is not so uninsurable as is generally thought; but Dr. Christison expressly states, that he does not give this as a decided opinion, because the cases hitherto observed are too few in number to enable him to draw satisfactory conclusions. In the Earl of Mar's case, the insurance company was found not entitled to refuse payment; not, however, on the ground that the practice of opium-eating is harmless to longevity, but because it was stated, that the insurance company did not make sufficient inquiries into his lordship's health and his habits. A new trial was afterwards granted, but the matter was finally compromised.

The study of the effects of opium-eating upon health and longevity has recently derived additional interest from the transactions which have occurred in China; for it will be remembered, that the contraband sale of opium by British merchants was the alleged reason of the discontinuance of friendly relations between this country and the Chinese empire.

Opium is consumed in various ways for the purpose of temporary gratification. In England and other European countries, including Turkey, it is taken in pills, or in the shape of laudanum; in many parts of India it is taken in solution in water, and in China it is made into a preparation for smoking. It is quite true, that many writers, who have travelled in those countries where opium is extensively consumed, describe the most appalling effects as resulting from its use; but when these accounts are examined it will be found that they consist in mere assertions, and that no distinct cases are brought forward in their support.

I have long believed that the practice of opium-eating, as it is called, is not so destructive to life and health as is generally supposed, and that opinion is every year rather strengthened than otherwise, for I have looked in vain for any authentic instances of disease or premature death, attributable solely to this cause; though I by no means assert, that such instances do not exist. I feel confident that its deleterious effects are far inferior to those of intoxicating liquors, which do certainly produce the most disastrous consequences in those who indulge in them—effect appreciable and visible injury to the different important organs of the body, as the stomach, the lungs, the heart, the liver, and the brain—and are the frequent exciting causes of temporary delirium, or even of confirmed insanity. Here I wish it to be understood, that I do not touch upon the moral question of opium-eating; all artificial stimuli, which induce a fictitious exhilaration of spirits, deadening the stings of conscience, or blighting the efforts of industry, are, in a moral point of view, indefensible; and he who neglects noble pursuits and intellectual exertions, to bury his faculties in the wild delirium which constitutes the opium-eater's Paradise, is an object to be pitied, if not abhorred; but this is not the question here to be determined, it is for us to know, whether the practice of opium-eating has been known, by an accurate examination of a multitude of cases, to injure the body and mind of man.

Dr. Christison, who offers no dogmatic opinion whatever, has made some interesting observations upon eleven cases which came under his own immediate inspection, all of which would lead us to infer, that the practice of opium-eating tends neither to shorten life nor to induce disease. The following are some of the most striking of these cases:

An eminent literary character (Coleridge) died at about the age of sixty-three; he was in the habit of drinking laudanum to excess from the age of fifteen; his daily allowance was sometimes a quart of a mixture, consisting of three parts of laudanum and one of alcohol. A lady, alive at the time of the report, aged seventy-four, had taken laudanum in the quantity of half an ounce daily between thirty and forty years. An old woman died at Leith, at the age of eighty, who had taken about half an ounce of laudanum daily for nearly forty years, and enjoyed tolerable health all the time. An eminent literary character, aged about fifty when the account was written, had taken laudanum for twenty-five years, with occasional short intermissions, and sometimes in enormous quantity, but enjoyed tolerable bodily health. A celebrated Cutchee chief was mentioned by Dr. Burnes, as having taken opium all his life, and was alive, when the narrative of his case was drawn up, at the age of eighty, paralysed by years, but with his mind unimpaired.

With such evidence of a positive nature offered in opposition to vague assertion, it can hardly be doubted that the accounts of some oriental travellers are at least somewhat exaggerated. It remains for some well-qualified man to institute a series of accurate inquiries as to the effects of opium-eating, observed among the eastern nations, and to give some definite ideas upon this subject.

The morbid appearances which are observed in the bodies of those who have died of poisoning by opium, are the following, and they are well deserving of attention, because, in such cases, the medical evidence is of the highest importance, and often determines the jury as to the verdict which they are bound to return. I shall show, however, that this evidence of *post-mortem* appearances ought to be given with the greatest caution, because the morbid signs are very liable to be confounded with those produced by natural disease.

The external part of the body is generally livid, an appearance which is commonly considered by the public as indicative of poisoning; but as it is well known to medical men that this discoloration is very frequently seen in the bodies of those who have died from natural causes, no reliance can be placed upon it as a distinctive sign. As opium, like prussic acid, is not endowed with any irritant or corrosive property, its presence is never marked by inflammation or ulceration of the parts with which it comes in contact; and as, like that acid, it is rapidly absorbed in to the system, no trace whatever of its existence may remain in the stomach, except its odour, which is not always discernible, and when it is, cannot be relied upon with confidence.

The blood is universally fluid, as in death by prussic acid, and, indeed, in all cases where the death has been sudden or violent. The brain, however, is the organ principally affected; and, as the effect of opium is to produce congestion of its vessels, the veins and sinuses of this part are found gorged with blood. As this appearance, however, is also found in cases of death by suffocation or drowning, and in some varieties of apoplexy, no definite conclusions can be drawn from this circumstance. If it be asked, What are, then, the peculiar appearances observed in cases of death from opium? I answer, None, unless the poison be actually found in the stomach; for as opium causes death by inducing a form of apoplexy, it is clearly impossible to draw an accurate distinction between the effects of the poison and those produced by natural disease.

The treatment of poisoning by opium is well understood, and is always attended with success if the remedial measures be adopted at a sufficiently early period. As this poison is not so rapidly absorbed into the system as prussic acid, and as its powers are not so destructive, the patient may frequently be

restored, even after it has been swallowed for a considerable period. As in the case of prussic acid, no antidote can be said to exist to neutralize the powers of opium, and the primary object which ought to be held in view, is the removal of the poison from the stomach, which may in general be easily and safely effected. A strong emetic should be therefore immediately administered, and the best substance to employ for the purpose, is the sulphate of zinc dissolved in water. This salt should be given in pretty large doses, as from half-a-drachm to two scruples, and it is advantageous to prescribe it in such quantities, for small doses of white vitriol are themselves poisonous, and do not act as emetics, whereas large ones are at once rejected from the stomach, carrying away the other contents at the same time. Sulphate of copper, which is also sometimes recommended, is by no means so eligible as sulphate of zinc, because its emetic powers are not so speedy, and if retained in the system, it operates as a destructive poison. If, however, the emetics have failed to operate, and the case be urgent, the stomach-pump should be employed without delay. It is a common error to employ the stomach-pump indiscriminately in all cases of poisoning, by which frequently more harm than good is produced. Where an antidote exists to the poison swallowed, it is far better to administer it, and omit the use of the stomach-pump altogether. In poisoning by arsenic, its efficacy is dubious, owing to the sparing solubility of the poison, and when prussic acid has been swallowed, it is wholly useless. But in poisoning by opium, the stomach-pump is of eminent service, and its employment should never be omitted in such cases. Another remedy, which, however is only to be recommended when emetics have failed to operate, or a stomach-pump cannot be procured, is the injection of tartar-emetic into the veins.

The patient must be constantly roused, and not allowed to sit down, or lie on a bed, and all his importunities to be allowed to do so must be resisted: he should be forced to walk about in the open air, and this excitement of the patient should be farther promoted by dashing cold water over the head and face. It is always proper to stimulate the nostrils by tickling them with a feather, and holding strong spirits of hartshorn under the nose, and the internal administration of ammonia, camphor, musk, and other stimulants has been sometimes attended with benefit. In desperate circumstances artificial respiration may be employed, and in Dr. Christison's work a case is mentioned where life was restored after all hopes of recovery seemed to be annihilated.

The antidotes proposed in cases of poisoning by opium, as vinegar, tartaric acid, lemonade, infusion of coffee, decoction of galls, chlorine water, and others, have been found by Orfila to

be useless, unless the poison has been expelled from the stomach, with the exception of the decoction of galls, which he thinks may act as an imperfect antidote. The vegetable acids are objectionable, because they tend to dissolve morphia, and thus facilitate its absorption into the system; but after the poison has been expelled, the vegetable acids and coffee have been found useful in reviving the patient, and restoring the tone of the stomach.

I shall conclude this lecture by relating a very severe case of poisoning by opium which came under my own notice, and in which a complete recovery took place.

A girl, aged nineteen, was brought into the Islington Infirmary, having taken two ounces of laudanum an hour and a half previous to her admission; she was then very drowsy, but answered questions in a rational manner. A drachm of sulphate of zinc was immediately administered which caused her to vomit freely. The stomach-pump was then used, and the contents of the stomach completely evacuated. She was then taken into the yard and compelled to walk about between two men. An hour and a half after admission, she was exceedingly drowsy, and begged to be allowed to sit down; she complained of great pain and giddiness in her head; she answered questions, when put to her in a loud tone of voice, but after answering, appeared to relapse into torpor. The pupils were contracted nearly to the size of a pin's head, and did not dilate on the removal of light. Strong coffee was administered freely, ammonia was held to the nostrils, her ears were tickled with a feather, and she was pinched and shaken. Cold water was also poured upon her head and face. The pulse, which before was imperceptible, now began to be felt and she appeared in some degree to revive from her stupor. She was then taken up stairs, and two women were directed to watch her during the night. Mustard poultices were applied to the calves of the legs, and the administration of coffee and the application of the means of keeping her awake above described, were continued. By these means she was effectually prevented from sleeping, and she eventually became decidedly better. The next day she was much improved; but still complained of drowsiness and great pain in the head. These symptoms continued for some days, but they were removed by the administration of saline purgatives, and she was discharged cured.

Such are a few of the most important facts connected with the history of opium; a substance which, though destructive in large doses, is when employed with proper precaution in the treatment of disease, one of the most valuable medicines which science has conferred upon mankind.

PHARMACEUTICAL MEETING,

DECEMBER 14th, 1842.

MR. PAYNE, VICE-PRESIDENT, IN THE CHAIR.

ON GRAINS OF PARADISE.

BY JONATHAN PEREIRA, M.D., F.R.S., & L.S.,
Honorary Member of the Pharmaceutical Society.

In a preceding paper* I have shown, that in the east the name of Grain of Paradise is applied to the Ceylon cardamom; and, thinking it probable that other scitamineous fruits may have probably borne the same name, I have been led to make some investigations on the subject, the results of which are subjoined.

I endeavoured, in the first instance, to ascertain what circumstances led to the application of the name "Grain of Paradise," to the fruit or seeds of a scitamineous plant, but have not found authors agreed on this point. Marmot, quoted by Barbot,† says, "that before the coming of the Portuguese to this coast of Malaguette, the merchants of Barbary repaired thither to fetch off this pepper [Malaguetta pepper]; traversing the whole kingdom of Mandinga in Nigritia, and the country commonly called Guinea, *i. e.*, Genehoa and the Lybian Deserts; and from Barbary some quantity of that spice was transported into Italy, where it was called Grains of Paradise, because its origin was unknown there." But Valentini‡ says, that the seeds, "vel propter pulchritudinem, aut odorem valde gratum, quem recentia spargunt, grana Paradisi vocata."

I find that the term, Grains of Paradise, has been applied to the produce of no less than six scitamineous plants; and there is a seventh fruit which may have at times, perhaps, born the same name.

1. The *Melligetta, Grana Paradisi*, or *Cardamomum piperatum* of Valerius Cordus§, appears to be identical with the hot acrid seeds now known as Grains of Paradise, and which were exclusively brought from Guinea, whence their name of *Guinea grains*. They are the produce of *Amomum Grana Paradisi*, Smith.‖ Cordus states, that the fruit resembles an egg in shape and size, and that the seeds have a hot flavour like that of pepper and ginger. These characters leave no doubt as to the identity of his Melligetta with our Grains of Paradise.

* *Pharmaceutical Transactions*, vol. ii., p. 384.

† Churchill's *Collection of Voyages and Travels*, vol. v., p. 138. Lond. 1732.

‡ *Historia Simplicium reformata*. Francof. 1716.

§ *Historia Stirpium*, lib. iv., p. 195. 1561.

‖ *Rees' Cyclopædia*, vol. xxiii., art. *Mellegetta*; also vol. xxxix., art. *Amomum*. Roscoe (*Monandrian Plants*), declares, that his *Amomum Melegueta*, which he considers to be a distinct species, yields the Melegueta pepper of the shops.

2. The *Cardamomum majus* of Cordus has been confounded by many writers with his Melligetta. He appears to have been well aware of the error, for he observes, " Errant quotque dicunt, Melligettam, majus Cardamomum esse. Cardamomis enim tenuis minimeque fervens sed gratus ac jucundus est sapor, Melligettæ vero piperis instar acerrimus." This cardamom is the produce of *Amomum angustifolium*, Sonnerat* and Smith†, the *A. madagascariense* of Lamarck.‡ It can scarcely be doubted, therefore, that Linnæus§ and other botanists, who give Madagascar as one of the habitats of the Grain of Paradise plant, have confounded the Guinea plant (*Amomum Grana paridisi*, Smith) with that of Madagascar (*A. angustifolium*, Sonnerat); for the Grains of Paradise of commerce are always brought from Guinea. Some very fine samples of the Madagascar cardamom (*Cardamomum majus*, Cordus) are contained in Dr. Burgess's collection of Materia Medica at the College of Physicians. One of these I have figured in my " *Elements of Materia Medica*," vol. ii., under the name of the *Madagascar cardamom*. I have recently received specimens of this fruit under the name of *Cardamoms from Abyssinia*, from Professor Royle. The seeds have an agreeable aromatic flavour, and are totally devoid of that excessively hot acrid taste which is so characteristic of the Melligetta pepper, or Grains of Paradise brought from Guinea.

3. Gærtner‖ has figured the fruit and seeds of a scitamineous plant under the name of *Zingiber Melægueta*, and which he considered to be identical with the Grains of Paradise. The seeds, however, are readily distinguished from the real Grains of Paradise by their leaden colour, and their slightly aromatic flavour. Several capsules, in very good preservation, are contained in the Sloanian collection of fruits in the British Museum. According to Sir James Edward Smith,¶ the plant which yields them is a native of Sierra Leone, and is called by the natives *maboobo*. He terms it *Amomum macrospermum*, or the *large-seeded Guinea amomum*.

4. There is occasionally imported into this country a scitamineous fruit known by the name of the *Java cardamom*. It is the *Cardamome fausse maniguette* of Guibourt.** My friend, Dr. Royle, informs me that at Saharunpore it is called *Bura Elachee*, or *great cardamom*, while in the Calcutta market it is known as the *Bengal cardamom*. Ainslie †† calls its seeds

* *Voyage aux Indes*, t. ii., p. 242.
† *Rees' Cyclopædia*, vol. xxxix., art. *Amomum*.
‡ *Encyclopédie Methodique*, div. *Botanique*.
§ *Species Plantarum*. Holmiæ. 1753.
‖ *De fructibus et seminibus plantarum*.
¶ *Rees' Cyclopædia*, vol. xxxix.
** *Hist. des Drogues*.
†† *Materia Indica*, vol. i., p. 54, 5.

greater seeds of cardamoms, and gives as synonymes *Burrie Eelatchy*, and *Desi Elachi* (*country cardamoms*). The former of these terms agrees with that assigned to these fruits by my friend, Dr. Royle. Ainslie appears to consider these seeds as identical with Grains of Paradise, and accordingly refers them to the *Amomum Granum Paradisi*. But I have elsewhere* shown it to be the produce of *Amomum maximum*, Roxburgh, a native of Java,† and which is cultivated at Nepal‡. Hence the fruit is sometimes called *Java cardamoms*, or *Nepal cardamoms*. I have recently received from my former pupil, Mr. Thomas Brydon, now of the firm of Bruce & Co., of Madras, five samples of this same fruit, procured from a dealer. They varied somewhat in size, and bore the following names supplied by the native dealer:

1. "*Large sized cardamoms.—Not known where from.—Used as Medicine.*"
2. "*Segoor Jungle cardamoms.—Medicinal.*"
3. "*Cardamoms collected on the Malabar Coast.—Medicinal.*"
4. "*Round Cochin cardamoms.—Medicinal.*"
5. "*Odd or spare cardamoms.—Not known.—Used as Medicine.*"

If the capsule be soaked in hot water, from nine to thirteen membraneous wings become apparent, and which distinguish this from every other kind of cardamom which I have hitherto met with in commerce. The seeds are feebly aromatic.

5. I have already shown § that *Ceylon cardamoms* (*Elettaria major*, Smith) have been confounded with Grains of Paradise (*Amomum Granum Paradisi*, Smith). The substitution of the one for the other was known to Dale,‖ who observes of the Ceylon cardamoms, that "rarius in nostris officinis inveniuntur; alii enim Grana Paradisi officinis dicta seu Meleguetam, non sine errore, alii Amomum verum *Ger.* horum loco substituunt." And Lewis**, in speaking of the Ceylon cardamom, which he calls "*Cardamomum medium*," observes, that "there is some confusion in regard to the name; that of *Cardamomum majus* being applied among us to this species, and in France to the *Grana paradisi*."

6. Burmann †† refers Grains of Paradise to his "Cardamomum Zeylanicum fructu rotundo nigro," and which I presume is the *Alpinia Allughas* of Roscoe. But the greatest confusion exists in Burmann's work, with regard to the synonymes of cardamoms and grains of paradise. He confounds no less than five or six distinct fruits with his round black Ceylon cardamom.

7. The last scitamineous fruit which I have to notice is a very rare one, and I shall distinguish it by the name of *Clusius's car-*

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* *Elements of Materia Medica*, vol. ii., p. 1028. 2d edit.
† Blume, *Enum. Plant. Javæ.*
‡ Hamilton (Buchanan), *Account of the Kingdom of Nepal.*
§ *Pharmaceutical Transactions*, vol. ii., p. 384.
‖ *Pharmacologia*, p. 252. 3tia ed. 1737.
** *An Experimental History of the Materia Medica*, p. 177. London. 1761.
†† *Thesaurus Zeylanicus*, p. 54.

damom, because I believe it to have been first described by Clusius*, who observes, that although it has some resemblance to Melegueta, yet if the two fruits be carefully compared the difference is very obvious; and he then proceeds to point out the distinctions between them. Its origin was unknown; it was collected by an apothecary, who died on his voyage, without leaving any memorandum respecting it. More than two hundred years afterwards a second specimen of the same fruit was accidentally found in a druggist's shop, by Sir James Edward Smith †, who has described it under the name of *Amomum Clusii*. He thinks it was met with in a chest of great cardamoms (Madagascar cardamoms). A third specimen was given me by a druggist a few years since ‡. These are all the known specimens which have been met with. The capsule might be confounded by superficial observers with either Mellegetta or the Madagascar cardamom; but the seeds at once distinguish it. They are totally devoid of the acrid hot taste of the Mellegetta; are not at all angular, but oblong or ovate, slightly inclining to cylindrical, and are so highly polished that they appear as if varnished.

These seven scitamineous fruits thus briefly noticed, are, as far as I have been able to ascertain, the only ones to which the name of *Mellegetta*, or *Grain of Paradise* has been applied. At the present day, in England, this name is used to indicate the hot acrid seeds brought from the coast of Guinea (hence called *Guinea Grains)* and produced by the *Amomum Granum Paradisi* of Sir J. E. Smith. A very erroneous notion has long prevailed that they are poisonous; and, as they are employed principally to give a pungent flavour to spirituous liquors, &c. the very heavy duty of two shillings per pound was imposed on them, and which was intended to act as a prohibition to their use. I see, however, that by the new tariff, introduced by Sir Robert Peel, the duty is lowered to fifteen shillings per cwt.

GAY-LUSSITE,
A DOUBLE CARBONATE OF SODA AND LIME.

BY MR. FOWNES.

HAVING been requested by the Council of the PHARMACEUTICAL SOCIETY to examine a crystalline mineral substance §, sent from Merida, in the province of Venezuela, South America, with a view to ascertain its nature, and learn if it could be converted to economical use, I submit the following note to the members:

The substance occurs in exceedingly irregular lengthened

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* *Exoticorum*, lib. ii., cap. xv. 1605.

† *Rees' Cyclopædia*, vol. xxxix.

‡ Lucae, of Berlin, to whom I showed this fruit, told me he had before met with a specimen under the name of *Melaleuca Cajaputi*.

§ This mineral was sent to the Society by Mr. Fisher of Liverpool.

crystals, somewhat resembling the small crystals of selenite occasionally met with in the London clay deposit, colourless and transparent, when not contaminated by mechanically inclosed impurities, and frequently having their faces deeply marked by striæ, crossing obliquely from side to side. The crystals are moderately hard, but brittle and easily powdered, the fracture is conchoidal, with strong glassy lustre.

When put into acid, this substance readily dissolves with copious evolution of carbonic acid, and the solution is found to contain lime and soda in large quantity. Exposed to heat, the crystals break to pieces, and finally crumble to a white powder, with disengagement of vapour of water.

By the aid of these characters, the crystals were easily identified with a mineral from the same locality, formerly analyzed by Boussingault, and to which he gave the name "Gay Lussite," in honour of his illustrious countryman. This conclusion was correct, as the following analysis clearly shows :—

100 parts contained

Lime	18.04	18.68	18.8
Soda	20.88	21.28	
Carbonic acid	29.6		
Oxide of iron and alumina with trace of phosphoric acid	.8		
Water	30.4	30.4	
Traces of chlorine and sulphuric acid, and loss	.28		
	100.		

These results point out the formula

$$Ca\,O, C\,O_2 + Na\,O, C\,O_2 + 5\,H\,O,$$

as the true representation of this curious compound. Reckoned to 100 parts, this formula gives

Lime	19.13
Soda	21.01
Carbonic Acid	29.66
Water	30.2
	100.

Boussingault's experiments gave him *

Lime	17.70
Soda	20.44
Carbonic acid	28.66
Clay	1.00
Water	32.20
	100.

* *Annales de Chimie et de Physique*, 31—274.

Gay Lussite is decomposed by water even in the cold —carbonate of soda being dissolved out, and carbonate of lime left behind; at a boiling temperature, this change takes place much more rapidly.

100 grains of the mineral in fine powder, boiled with water for two hours, and the whole placed upon a filter, gave after complete washing, 35.2 grains carbonate of lime, and 34.5 grains dry carbonate of soda; the theoretical quantities would be 33.97 of the first, and 35.85 of the latter, on the supposition that the changes were complete. The carbonate of lime obtained, gave, after being heated to redness, on the addition of water, an alkaline solution, showing that a little soda had been left behind. The carbonate of soda was nearly pure, it contained a very little sulphate, and a mere trace of chloride.

If this mineral can be obtained in large quantities at an easy rate, and the expense of transport be not too considerable, there is no doubt but that it might be made available as a source of carbonate of soda, and that by a process of the simplest kind, while the product would greatly surpass in purity that derived from common salt by the intricate method of proceeding at present in use. Carbonate of soda is an article of such immense consumption, and its abundance so intimately connected with the prosperity of some of our most important manufactures, that a new and plentiful source of the salt would clearly be a national gain.

It might be worth while also to try its efficacy as a manure, when applied in the same manner as nitrate of soda; in soils deficient in alkali, it might possibly be found advantageous, as affording, by its gradual decomposition by the moisture of the ground, a very permanent and steady supply of soda-salt.

In a scientific point of view, Gay Lussite is an interesting substance, as affording an additional argument for classifying lime, in respect to its isomorphous relations to other bodies, among the oxides of the magnesian group of metals. The double salts of lime at present known are few in number, and the fact of its forming in this case a double salt with soda is of value, that base, together with the other members of the small class to which it belongs, namely potash and ammonia, being remarkable for a tendency to form saline combinations of this kind, into which magnesia and its representatives enter.

ON THE PREPARATION OF SYRUPS AND OXYMELS.

BY MR. JOHN SAVORY.

I FEEL persuaded that I cannot more essentially contribute to advance the objects for which this Society was instituted, than by collecting together such information as may be of

practical utility to its members, and enable them properly to prepare, and even improve upon, the formulæ of the London Pharmacopœia. It is not to be expected that a Pharmacopœia should enter into minute details, either of the manipulations or of the means by which the various preparations are produced; the limits necessarily assigned to such a work would not admit of it. When we reflect, however, upon the importance attached to the different Dispensatories, and to the comments upon our Pharmacopœias, we must be aware, that more precise information ought to be furnished; and it appears to me, that this society is the proper school from which it should emanate. Its members especially devote their attention to Pharmacy, their best interests are identified with its advancement, besides which they possess the greatest opportunities; for they have monthly meetings, and likewise a Journal, as mediums through which they can communicate the knowledge they have gleaned. It is with the conviction that I have an opportunity, through the society, of drawing the attention of practical men to a subject of some importance, that I venture to offer to your attention my own observations and experience upon the preparations of syrups and of honeys, a class of compounds generally disregarded, too often inelegantly prepared, and almost always unsatisfactory to all parties.

Syrups are not held in the same estimation in this country that they are on the continent; here they are generally regarded as mere adjuncts by which medicines are rendered less disagreeable, but in France their use is not limited to such narrow bounds, for not only are they administered as simple remedies, but they are employed for the most powerful medicines; whilst our officinal syrups are but fourteen in number, the French Codex exhibits no less than 111. The difference between these medicaments, as furnished in France and in England, is most extraordinary, and demands our investigation. Notwithstanding the greater coolness of our climate, their syrups are superior to ours in all their characteristics, they do not undergo the same rapid decomposition, their external appearance is much more normal, and they continue to possess the qualities with which they were originally embued for a much longer period.

These circumstances must naturally be dependent on our method of preparing these compounds, and I shall endeavour to point out such manipulations as my own experience, founded upon continental writers, teaches me is the best calculated to carry out the object required. The first point to which attention is to be directed is the prevention of the apparently spontaneous decomposition to which all syrups are subjected, and which so materially affects their properties. Sugar in a state of absolute purity is not liable to spontaneous decomposition; but its

elements have but a feeble attraction for one another, and they may be readily induced, in the presence of water, to alter their arrangements and enter into new combinations. It is however necessary that some foreign body should be present to effect this change, otherwise their equilibrium is not disturbed. Various substances, such as gluten, possess the power of producing in sugar that peculiar decomposition to which we attach the name of Fermentation. The conditions necessary for this process have been investigated lately with considerable ardour by many eminent Chemists. There are several facts connected with the chemical history of those substances which appear likely to throw considerable light upon the subject of this investigation. The Chemists to whom I have alluded have arrived at the conclusion, that when putrescent animal or vegetable substances are in mixture with matter of somewhat analogous composition, and the balance of whose affinities is somewhat delicate, such substances are capable of inducing, in bodies holding such relationship to their own, a condition similar to that in which they exist; thus the most minute portion of some substances, already in a state of decomposition, will cause similar substances to themselves to pass into fermentation, and new changes are rapidly effected. It is to the element nitrogen this process has been attributed, for we find that compounds abounding in this principle more readily run into decomposition, and hence it follows, that fermentable matter generally contains this element.

From these facts, we deduce a tolerably clear insight into the nature of those agents which deteriorate our products, and we are also enabled, with greater precision, to suggest the means by which we may either neutralize or remove them. We have been accustomed to look upon the azotized principles of plants, as distinct from each other, under the names of gluten, albumen, legumine, emulsin, and pollenin; but the opinion now prevails that these are different forms of albumen, or are so analogous in their properties as to admit of being considered collectively; they putrefy rapidly in the presence of oxygen, and then produce, by induction, corresponding changes in other proximate principles, such as starch, sugar, gum, lignin: this is sometimes attended with a disengagement of carbonic acid gas; at elevated temperatures, they pass with more or less rapidity into a state of insolubility, and during ebullition are raised to the surface, and may be easily removed. In the manufacture of syrups, one or more of these principles are usually present, derived either from the sugar or from the medicaments employed. In the preparation of syrup, the effect of sugar in preventing oxidation should always be borne in mind. Iodide of iron may be boiled in syrup, and in contact with atmospheric air without undergoing any ma-

terial change; and the hydrated protocarbonate of iron in the steel pill, furnishes us with another instance of its agency in this respect. A temperature necessary for ebullition destroys by oxidizement many vegetable principles—this may frequently be prevented by an excess of sugar; and my experience would lead me to conclude, that the volatile and aromatic principles of plants, are retained with more energy by a boiling liquid having an excess of sugar, than where it exists in diminished quantity, provided that ebullition be accelerated by broken glass or small pieces of metal; should this precaution be omitted, then the temperature required must be considerably more than 212°. Professor Liebig has given us some brief but very interesting observations on the odour of plants. He says,

"Probably the peculiar odorous principles of many vegetable substances, are newly formed during the fermentation of the saccharine juices of the plants. At all events, it is a fact, that very small quantities of the blossoms of the violet, elder, linden, or cowslip, added to a fermenting liquid, are sufficient to communicate a very strong taste and smell, which the addition of the water distilled from a quantity a hundred times greater, would not effect. The various kinds of beer manufactured in Bavaria are distinguished by different flavours, which are given by allowing small quantities of the herbs and blossoms of particular plants to ferment along with the wort."

I extract this paragraph from Liebig's work, because it throws out hints upon a peculiarity of fermentation, attended with a production of aroma, an idea rendered probable by the acknowledged improvement in the smell which essential oils and distilled waters acquire by keeping, the development of which may be the object which leads to the practice on the continent of aromatizing, as it is termed, syrups. All these considerations have a practical bearing, and indicate to us the plans we are to pursue. Should we apprehend fermentation, every thing that can advance it must be removed, when it can be done without injury to the product, and this is best effected by boiling, by coagulation, and by filtration. Should this last process be impracticable, we must endeavour to check the tendency to decomposition, by innoxious antiseptics, such as alcohol, animal charcoal, &c. Should oxidation be the probable cause of mischief, we must leave the syrup in a state which least favours the inroads of change; to this end, attention must be directed to the density of the syrup, and to the temperature at which it is kept. The college orders a temperature of 55°, but I fear this is not always to be obtained. For determining density, a small instrument on the principle of the hydrometer, and called by its inventor *Beaumé*, an areometer or saccharometer, is used. In the common way, when this instrument stands in syrups at 30°, the temperature being 212°, the water is just saturated with sugar, and to this degree it is necessary that all syrups which do not

contain large quantities of vegetable matter, should be reduced; but in the instances of syrup of poppies, of senna, and of sarza, a greater reduction is required, or fermentation will ensue. It is found, however, that the large amount of extractive they contain prevents crystallization of the sugar, so that the extra reduction is unobjectionable. Besides these sources of failure, we are exposed to others which require to be commented upon; for instance, syrup of saffron and of red roses are very apt to precipitate their colouring matter, and syrup of lemons will become mouldy or ropy. This may be obviated in the latter syrup, by the employment of alcohol. The colouring principle of the rose and of saffron, I consider to be in a simple state of solution, and in making a syrup, we are in this dilemma, that the dilution which favours solubility in the colouring matter, encourages decomposition; whilst concentration, though it preserves the syrup, leads to the precipitation of the colouring matter. Hence the preparation of these syrups is exceedingly difficult, and I know of no better plan to pursue than to adopt a medium course, yielding to each condition in turn, as may be required.

Having now discussed the various circumstances which act upon syrups, and given a general view of them, I beg to call your attention to those which are contained in our Pharmacopœia whilst I apply my observations founded on what I have stated to each of them.

SYRUPUS SIMPLEX.

The plan we adopt in making this syrup is, first to dissolve the sugar (whole) in the water, by means of a water-bath, then set the solution aside for twenty-four hours, remove the impurities, and pour it into a clean and well-tinned pan; boil with a gentle heat, throwing in occasionally a small quantity of cold water, removing the scum as it rises, and when the saccharometer stands at 30°, take the syrup from the fire and pass it through flannel while hot. When quite cold put it into clean dry bottles, well corked, and place it in a cool cellar. This syrup, when properly prepared is inodorous, thick, viscid, nearly colourless, and perfectly transparent. For the production of a clear and bright syrup, distilled water and well-refined sugar are essentially necessary, as common water, and more especially the spring-waters of London, contain lime, which is precipitated by boiling, and the syrup becomes turbid. When this is the case it should be clarified by beating the white of an egg to a froth, with three or four ounces of water, mixing this with the syrup and boiling it until no impurities arise; should it be required quite colourless animal charcoal must be boiled with it.

SYRUPUS TOLUTANUS.

In preparing this syrup we triturate the balsam of tolu with half the quantity of sugar, these ingredients are then mixed with the water prescribed, and allowed to simmer for twelve hours in a water-bath. When the solution is cold, filter, and add the remainder of the sugar in the manner directed for the preparation of the simple syrup.

This process affords a syrup as limpid as water, and of a much finer flavour than that prepared in the ordinary way.

It may be interesting to the society to be made aware, that the experiments on balsam of tolu, mentioned in an early number of their TRANSACTIONS, have been repeated in our laboratory, and that the result is a confirmation of Soubeiran's statements. The conclusion arrived at by the Editor of the Journal, in reference to our officinal syrup, is correct; namely, that no diminution in the quantity of the balsam can be admitted; some rich samples might be employed in smaller quantities, but with the average samples it cannot be.

SYRUPUS AURANTII.

——— LIMONUM.

I must here remark, that there is a studious avoidance of heat in the college direction; but why this occurs I am at a loss to comprehend, unless it be for the preservation of the aroma in the orange syrup. I have found these syrups most troublesome; they run in a very short time into fermentation, even when kept in a cool vaulted cellar, at the temperature of 45°. The plan we have lately adopted in our establishment of making these syrups, has been to boil with as little delay as possible, until all feculent and albuminous matter is separated; and when cold, to aromatize the orange and lemon, according to the French method, leaving them respectively at a density represented by 30° of the saccharometer ($30\frac{1}{2}$ should it be very hot weather), the thermometer standing at 212°.

SYRUPUS PAPAVERIS.

——— SENNÆ.

——— SARZÆ.

It is here that I wish to impress upon the society, the power possessed by sugar to prevent oxidation. It is my opinion, and I believe that I am borne out by experience, that a temperature of 212° does little injury to fixed vegetable principles, when in contact with large quantities of sugar. It is accordingly our uniform practice, when making syrup of poppies and sarza, to extract their active principles by a moderate heat, adding the sugar at an earlier stage of the process, and then to evaporate at

a boiling-point, clearing away the scum which arises in large quantities, until the syrup arrives at a density of 30°, at which point it is to be removed and evaporated in a water-bath till it arrives at 32°.

SYR. CROCI.
— ROSÆ.
— RHÆADOS.
— MORI.
— VIOLÆ.

These syrups are employed chiefly on account of their fine colour or agreeable flavour; our object, therefore, is to leave these qualities in the greatest degree of perfection. Distilled water should be used in their preparation : I have seen infusion of roses quite green for want of this precaution ; the vessels also must be of glass or stone — every thing which is acted on by the constituents of the syrup being decidedly injurious. The syrups of saffron and red roses admit of being boiled, and are to be strained off at 29°, the better to retain their colouring matter in solution ; the others are to be reduced by a gentle heat, till, when *cold*, they have a density of 34° and should be filtered through paper.

SYRUPUS ZINGIBERIS.

This preparation is too agreeable to be regarded with indifference, and yet, according to my experience, it soon ferments, and becomes unfit for use : made with a cold infusion, it is more permanent, but less grateful; another plan has recently suggested itself to me, which consists in treating syrup with the oil of ginger obtained by digesting the root with alcohol and evaporating, the oil is found on the surface towards the close of the process, one drop of which is absorbed and retained by one fluid ounce of syrup. It is preferable to that prepared in the ordinary way, being more pungent and aromatic.

In preparing honeys and oxymels, use clarified honey, avoid metal pans, and employ the heat of a water-bath, reduce oxymels to 28½°, honeys to 29½°, the temperature being 212°.

Specimens of syrups are now on the table, some of which were prepared in the early part of the summer, and have not exhibited the slightest tendency to fermentation.

There are several other syrups which I should have been desirous to have brought before you, but as I fear that I have already trespassed on your time, I must reserve my observations for a future opportunity.

Mr. Herring approved generally of the mode of operating in making syrups, recommended by Mr. Savory; he particularly advocated the use of the saccharometer, as the best means of determining the strength of the syrup.

Mr. Redwood observed, that it was quite as important to avoid adding too much sugar as the reverse, for when crystallization commences it does not cease at the point of saturation, and hence a hot syrup, in which a greater quantity of sugar is dissolved than it is capable of holding in solution when cold, becomes ultimately much weaker than it would have been if less sugar had been added at first.

An animated discussion ensued on various points alluded to in the paper, and especially with reference to the difficulty of preparing syrup of saffron which would retain its colour.

DONATIONS TO THE LIBRARY.

Weston's Botany, 2 vols.	1770-72	Mr. Churchill (Strutton Ground)
Motherby's Medical Dictionary	1785	
Eden's History of New Holland	1787	
Henry's Epitome of Chemistry	1806	
Reece's Medical Guide for Tropical Climates	1814	
Weatherhead on Rickets	1820	
Epps on Phrenology	1820	
Dobson on the Spleen	1830	
Epps on Epilepsy	1834	
Pharmacopœia Universalis by Rennie, parts 1-5		
The Chemist and Druggist	1839	
Culpeper's London Dispensatory	1653	Mr. H. J. Bailey (Little Newport Street)
Opera Hippocratis et Galeni, 13 vols. in 8 vols., folio	1639	Mr. Bell
The Manchester Pharmacopœia		Mr. Woolley

DONATIONS TO THE MUSEUM.

Mr. Bird, *Castle Street.*—Papaver somniferum, capsula and semina.

Mr. W. R. Wells, *London Street.*—Specimens of bad Opium—Ditto of bad Catechu.

Mr. Rowland, *Tottenham Court Road.*—Oil of Tea from China.

Mr. Lloyd, *Ludgate Hill.*—Vegetable Wax from Brazils—Kino from Swan River—Gum from New South Wales.

Mr. Hawthorn, *Snow Hill.*—Ricinus communis (mature fruit).

Messrs. Foulger & Son.—Tin of Balsam of Tolu (original package).

Mr. Taylor, *New Bridge Street.*—Sublimed Indigo.

Dr. Imray.—Native Sulphur.

Mr. Bell.—Specimens of bad Rhubarb—Ditto of bad Lactucarium—Strasburgh Turpentine.

Mr. Fordred, *Ashford, Kent.*—Two Specimens of decomposed Hydrocyanic Acid.

PROVINCIAL TRANSACTIONS.

FIRST ANNUAL REPORT OF THE BATH BRANCH OF THE PHARMACEUTICAL SOCIETY OF GREAT BRITAIN.

In the first year of the existence of the Bath branch Pharmaceutical Society, it cannot be necessary to present to the members a lengthened report of its transactions during that limited period, the main object of its establishment being to co-operate with the Parent Society in London, and to provide, as efficiently as possible, facilities for promoting the art and science of Pharmacy and Pharmaceutical Chemistry; and to attain this object, two things appear to be essentially necessary; first, the establishment of meetings of the members, at which mutual information and instruction might be more advantageously communicated; and, secondly, the formation of a library of books for reference, and the circulation by periodicals of such new matter as in the art and science of Pharmaceutical Chemistry is always advancing.

We have to congratulate ourselves on the liberality of several members, who have contributed to the library by the donation of several books.

We have also in circulation the following: Annals of Chemistry—Chemical Gazette—Bellingham's Materia Medica—Chemist—Proceedings of the Electrical Society of London. The three last are supplied gratuitously by some of the members, and we are in daily expectation of the American Journal of Pharmacy.

At the meetings of the past year not only has a most friendly spirit prevailed, and much valuable information been gained in conversation, which has resulted from the social nature of the assemblages; but some highly interesting and instructive papers have been read.

All the ordinary expenses of the Society have been defrayed, and a balance remains in the hands of the Treasurer of £3 : 3*s.* : 3*d.*

A continuance of that energy and zeal by which the society was established is required to enable it to maintain its ground usefully, and it is hoped that members will be stimulated to furnish such papers in the present year as shall be instructive and useful in Practical and Scientific Pharmacy, to advocate which the Bath Branch of the Pharmaceutical Society was established.

ON LINIMENTUM SAPONIS.

BY MR. HENRY SHUM.

(*Read at the Bath Branch of the Pharmaceutical Society, Nov. 22.*)

HAVING lately given some attention to the preparation of the linimentum saponis, I beg to offer a few remarks founded on the result of my observations on the subject; namely, that rectified spirit dissolves a very small quantity of soap without heat; and if heat be applied, a gelatinous mass is the result, whereas proof spirit dissolves it readily and largely.

The formula for soap liniment of the London and Dublin Pharmacopœias, is as follows:

Take of Hard soap, three ounces.
Camphor, one ounce.
Spirit of rosemary, sixteen fluid ounces.

Dissolve the camphor in the spirit, then add the soap, and macerate with a gentle heat until it be dissolved.

The formula for spirit of rosemary in the present London Pharmacopœia is,

Take of Oil of rosemary, two drachms.
Rectified spirit, one gallon.
Water, one pint.

Mix, then let one gallon distil with a gentle heat.

In the previous one it was,

Take of Rosemary, two pounds.
Rectified spirit, one gallon.
Water, one gallon.

Mix, then distil a gallon with a gentle heat.

The present spirit of rosemary is nearly of the strength of rectified spirit, while that of the last Pharmacopœia was rather overproof, differing of course according to the heat and care used in the distillation. If the oil is to be used, distillation might, I think, be dispensed with for the preparation of soap liniment, as the soap produces much the same effect in removing all harshness from the solution of the oil in spirit.

I have here a specimen of the liniment prepared according to the present Pharmacopœia. The spirit of rosemary being of the strength of rectified spirit, it is, as you see, a solid, gelatinous mass, even at this present summer temperature, and resembles that sold as Steers's opodeldoc. It appears not to be the intention of the college to produce such an article, since in the preceding preparation (linimentum opii), six *fluid ounces* of it are ordered to be mixed with two of tincture of opium, and this soap liniment requires a heat of 90° or 100° to be applied for some time to render it fluid. I also made some by the same formula, but substituting white soft soap for the hard soap. This is quite fluid at

summer heat, but begins to gelatinize at 60° Fahr., and becomes quite congealed at about 40°.

I then used oil of rosemary, and instead of using the above spirit of rosemary, dissolved the camphor and oil in eight ounces of rectified spirit, and added six ounces of distilled water, mixed with two ounces of rectified spirit, thus avoiding the precipitation of camphor. On dissolving either the white soft or the Castile soap in this solution, we have a liniment which will be fluid in summer and winter.

On trying half rectified spirit and half water (which is, I believe, the proportion used by most Druggists) part of the camphor was precipitated; but was re-dissolved on the addition of the soap, which renders this solution of camphor capable of being still further reduced with water. This also gives us a fluid liniment.

By comparison of all the above specimens, that seems the best which is prepared with spirit of rosemary, of the strength of proof spirit.

Mr. Bland's observations in the Journal of this month (November) lead me to revert to the common practice of reducing overproof spirit with an equal quantity of water to form proof spirit, whereas it requires nearly five parts by measure of spirit 56° overproof (specific gravity .835 at 56°), and only three parts of distilled water to produce proof spirit.

This error has very likely been handed down from generation to generation as part of the art and mystery in which a Chemist and Druggist instructs his apprentices, and has, perhaps, been practised without thought or trial; but as there must be a great difference between tinctures, &c. prepared with proof spirit, and those made with "half and half" every one should satisfy himself, by experiment, of the truth.

3, *Stall Street, Nov.* 16, 1842.

ORIGINAL COMMUNICATIONS.

ON THE ANALYSIS OF COD LIVER OIL FOR IODINE.

BY ANDREW URE, M.D., F.R.S., &c.

Having suffered for some time from pains in my right leg and foot, which resemble those of sciatica, I was induced to try the curative power of Cod Liver Oil, which I swallowed for several weeks in doses of a few ounces daily, but without any benefit. As its medicinal action has been ascribed to the presence of a minute quantity of iodine in a state of peculiar combination, I instituted the following experiments, with a view of ascertaining whether the Cod Liver Oils, as sold by two of the most eminent wholesale dealers in London, really contained iodine.

I saponified four ounces of the oil with quick lime, by means like those employed by the stearic candle manufacturers to saponify tallow, and I ignited the dry oleate of lime in a luted crucible. On lixiviating the residuum of the calcination, with alcohol, and testing the liquid for iodine, I could find no trace of it. Iodide of calcium is not decomposed by heat in close vessels, and as it is a deliquescent salt soluble in alcohol, had any been present, it should have been detected in this way.

I next saponified four ounces of the oil with potash, decomposed the transparent soft soap with dilute sulphuric acid, evaporated the saline solution, nearly to dryness, decanted from the crystals of sulphate of potash the small liquid residuum, and tested it for iodine, but could obtain no trace of its presence. This is the process proposed by Liebig, in the 2nd volume of his *Chimie Organique*, page 283; but Stein, in the *Journal fur Pract. Chemie*, xxi. 308, says, that the iodine is not to be detected in that way, for it adheres obstinately to the saponified oil, and cannot be found in the decomposed soap lyes. He therefore takes the oleic acid resulting from the decomposition of the potash soap by sulphuric acid, converts it once more into a soap, with potash or soda, carbonizes the dried soapy mass in a covered crucible, and from the resulting alkaline carbonate extracts whatever iodide may be present, by means of alcohol. Neither of the oils which I tried afforded any trace of iodine by this method.

M. Gmelin also carbonizes the soap, but takes that of the first saponification.

Now, since iodine can be detected by suspending a slip of paper coated with starch paste, in a phial over dilute nitric acid, containing not more than $\frac{1}{10000}$ part of a grain of iodide of potassium, I feel entitled to conclude, either that the cod liver oil sold as such in London is not genuine, or that some kinds of cod liver oil are destitute of iodine. There can be no doubt, from the researches of Stein and L. Gmelin, that iodine exists in certain varieties of it.

13, *Charlotte Street, Bedford Square,*
19*th December*, 1842.

ON FERMENTATION.

BY MR. JOHN P. BOYCE.

Being in the habit of making British wines in considerable quantities for sale, and also of brewing for my own family, I have read, with much pleasure, the able elucidation of the principles of fermentation by Mr. Fownes, in the series of papers which have appeared in the Journal, and who, in the conclusion of his last paper, having observed "that much benefit may

arise from a detail of all that passes in this, and other observed phenomena," I am emboldened to offer a few remarks, although they militate against a part of his theory.

At page 351, he says, "boiled wort will ferment after a fashion, but in a very slow and imperfect manner, and the product will be very offensive from putrid decay." Now the very reverse of this is the case if the fermentation is conducted in the following manner, with wort of a given strength :—

Having by the usual method of brewing obtained from twelve to fourteen gallons of wort from two bushels of malt, and boiled it an hour, adding, during the last quarter of an hour, two pounds of hops, we then put the liquor boiling hot with the hops into the cask it is intended to be kept in, placed in the cellar, and bung it down. The next day, or when cold, we fill the cask quite full, bung it down very tight, and insert a small bent tube into the top of the cask (the size used in supplying gas burners) the upper end being immersed in a vessel of water; care must be taken not to allow the end of the tube to reach the liquor in the cask, or on the disengagement of carbonic acid gas in fermentation, the beer will be forced out instead of gas. In a period varying from twenty-four hours to sometimes as many weeks, but generally in three days, spontaneous fermentation commences, and continues for some weeks, producing beer of a more delicate flavour, greater strength, and less tendency to run into the state of acetous fermentation than when yeast is used. I drank some perfectly sound a short time since, that had been brewed two years, and in draught eight months. A great saving of time and trouble is thus effected, as also the necessity of having coolers and an open space to cool the wort. But it has the disadvantage of sometimes not succeeding, from some inexplicable cause, arising perhaps from a slight difference either in the gravity of the wort, temperature or humidity of the different parts of the cellar it is placed in, or the state of the cask it is put into, as in six casks placed in the cellar, and filled with the same wort, fermentation will sometimes not commence in one for a long period after the others, and in this case the beer is not so good either in quality or flavour.

I at first imagined that fermentation was excited in all, and in one earlier than another, by a portion of fermentable matter in the cask, but this is not the case, as it goes on equally well in casks perfectly cleansed by soaking and scalding, in new ones, or in brandy casks. Two gentlemen who have brewed on this plan for the last two years, have been invariably successful, with the exception of a cask or two out of perhaps forty. Others have not been successful, myself among the number. In the first instance, fermentation in two casks placed in my cellar,

which is damp, did not commence until six months nearly, in the following spring, then only slightly, and the beer was not good.

The next two casks, one containing thirty and the other nine gallons, were filled with the same wort, and placed beside each other in a dry room. I did not ascertain at what period fermentation commenced, as from the drying of the cask, the tube had become loosened, and the gas escaped unobserved. The small cask was excellent, but on trying the large one with the saccharometer, I found the gravity but little decreased, and the beer very sweet, and then moved it into the cellar, thinking in time it would be good beer. It then became ropy, and was eventually thrown away. This was intended for strong beer, but as it is two or three years since, I forget the proportion of malt used, and, I believe, strong worts do not ferment so well by this method. If Mr. Fownes, or any other gentleman, will kindly favour us with any principles in elucidation of these phenomena, by which we may be better guided in this interesting and useful part of domestic economy, he will oblige, among many others,

J. P. B.

Chertsey, Dec. 14, 1842.

ON A PROCESS WHICH HAS BEEN TERMED THERMOGRAPHY.

TO THE EDITOR OF THE PHARMACEUTICAL JOURNAL.

Sir,—Observing that in your Journal there is a recital of M. Möser's conclusions as to the mode in which light acts, under certain circumstances, in the production of copies of figures or designs, I have thought it not unlikely that the detail of some practical experiments of my own might prove acceptable to your readers. On reading the report of what passed in conversation on the subject at the last meeting of the British Association, as published in the *Athenæum* of July 30, I recalled to mind certain effects which I had observed occasionally, as produced on glasses covering pictures or prints, and which consisted in the *general* form of the picture or print being rendered evident when the glass was *breathed on*, for the purpose of cleaning it; I confess, however, that I never had the slightest idea of the true cause of this effect, but considered it as, perhaps, due to an unequal hygrometric condition of the picture or print; this *impression*, under common circumstances, it is somewhat difficult to get rid of, and under certain circumstances, connected with a photographic process in which I am engaged, *very difficult*. I mention these facts merely to show, that *common* observation does not lead to any great results in experimental philosophy, but that it must be a

very acute degree of it which leads to conclusions such as those of M. Möser.

Mr. Robert Hunt, the talented secretary of the Cornwall Polytechnic Society, is, I believe, the first person who has published any account of experiments on the subject in this country. His paper is to be found in the *Athenæum*, of November 19th, and is very interesting; he differs, in some degree, from M. Möser in regard to the theory of the phenomena; but as far as I can judge, it is difficult to decide on any explanation which shall be satisfactory, of the causes of these singular and wonderful effects; and think that the safest course is to accumulate as many and as various facts as the subject will admit of at any rate, in these early days of the discovery.

My experiments are not numerous, but as they have been successful in all, except a very few instances, I have no hesitation in relating them.

A highly-polished copperplate being placed, face downwards, over a bloodstone seal, on which a figure was engraved, and which was supported so that its surface was not more than the twentieth of an inch from the copperplate, was left in the dark for about twenty minutes; when removed no appearance of a figure was visible, but when breathed on, a very slight impression became evident, but much stronger and permanent when the plate received the vapour of mercury. A mercurial apparatus may be temporarily arranged by putting a little mercury in a basin, or evaporating dish, and placing it over a chemical lamp or even a candle; but heat must be very gently applied, or the vapour will not condense on the plate.

Placing on a highly-polished copperplate the seal, a half-sovereign, a sixpence, and a farthing, and applying a very gentle heat for a minute or two, the articles were suddenly thrown off, and the plate submitted to mercurial vapour, the impression from the seal was *very* distinct; that from the gold was next in order, giving a very recognisable one of the head and lettering; that from the silver was less so, and that from the copper the least distinct of the four. This appears to point out that the *strength* of the impression depends on the difference in the conducting power of the material of the subject to *be copied*, from that of the material of the plate on which the impression *is received*.

Having placed the gold and silver coins on a copperplate, and supported that over a chemical lamp, and allowed it to become too hot to be safely touched, I found, on examination, that the impressions were strongly marked, that from the gold being by far the most so, but both much confused, resisting, however, an attempt to polish them out.

The most satisfactory experiment which I have yet tried, is one made after the mode described by Mr. Hunt, and is as follows: On a well-polished copperplate, spread, by means of a camel's-hair brush or a piece of clean rag, nitrate of mercury, then wash with water; and taking a small quantity of metallic mercury, rub it well over the plate with a piece of clean chamois leather till it is quite bright; lay a few pieces of blotting-paper on a flat board, on them the print to be copied, and on that the plate; press these into close contact for two or three hours (perhaps much less time would be sufficient); on separating them no picture is visible on the plate, but after submitting it to the vapour of mercury and to the vapour of iodine, a very perfect copy of the print was developed; the vapour of iodine may be applied by putting a small quantity of iodine into a cup, or capsule, and placing this at the bottom of a box, a glass jar, or even a deep dish, so that the plate may be placed face downwards, but at some distance from it, covering all with a cloth; no heat is to be applied.

It can hardly fail to occur to those acquainted with the Daguerréotype process, that, with the same materials, the same, or a similar result is obtained by so dissimilar an arrangement of them, and by so entire an *apparent* absence of light, upon the intensity of which, it has until recently been considered, the formation of photographic images of objects entirely depended.

I am, Sir, yours, &c.

HENRY COLLEN.

Somerset Street, Dec. 13.

THE MELILOTUS CÆRULEA.

BY MR. F. DIXON.

Ash, Kent.

HAVING seen in vol. ii. p. 128 of the PHARMACEUTICAL JOURNAL, an account together with a representation of the Melilotus Cærulea, a specimen of which was presented to the museum by Joseph Houlton, M.D., I beg to make a few observations on the same, as I consider it identical with a plant I have cultivated for the last eight years, and which I have named Trifolium Aromaticum. I have kept three different preparations of it; namely, an oil, ointment, and the distilled water, each of which have frequently been used, with much success, in recent burns, scalds, bruises, and contusions; it is also very beneficial in excoriations incident to children, and not less so in soothing the pain and allaying the irritation and swelling attendant on hæmorrhoids. I cannot speak of its virtues as an internal remedy, never having tried it; but I believe the plant to be well worthy of notice.

The seeds when bruised appear to possess a balsamic property, giving out in a sensible degree the odour peculiar to the flowers and plant generally. When first brought under my notice, it was prepared as an oil by infusing the flowers in it, and was quaintly called *pig* or *hog oil*, I cannot say for what reason, but this I can say, that the porcine tribe are very fond of it, and will greedily eat it either fresh or dry.

I expect to be in town next week, I will then bring with me some of the seeds of the above for the museum, if such will be acceptable.*

THE VEGETABLE IVORY, OR TAQUA PLANT.

(*Phytelephas macrocarpa.* Willdenow.)

COMMUNICATED BY MR. SMITH, OF HAMPSTEAD.

This tree, which resembles a palm, grows in the hot low valleys of the Peruvian Andes. The fruit at first contains an insipid and limpid fluid, with which travellers quench their thirst; afterwards, the liquid becomes milky and sweet, but increases in consistence till it becomes solid as ivory. The taste varies; if the fruit be cut off while soft, and filled with fluid, the liquid becomes sour if kept long. Of the nuts, the inhabitants form handles for knives, spindles, and other ornaments, which are whiter than real ivory, the colour and hardness of which they retain, provided they be not kept too long under water; but even then, when dried, they again become white and hard.

The Indians cover their cottages with the largest leaves, and the English manufacture all kinds of fancy articles with the nut, which in colour supersedes the elephant ivory.

INDIA-RUBBER COURT-PLASTER.

BY MR. B. C. ROWLAND.

The Pharmaceutical Journal, No. IV., 1st Vol. contains an article detailing the manner of making Mr. Liston's isinglass plaster, spread either upon silk or membrane. I am induced to lay before your readers, in furtherance of the same subject, the best method of making India-rubber Court-plaster, *which does not wash off;* thinking, as it has become an article now in general use, that the mode of its preparation may interest the Chemist and Druggist.

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* The seeds have been received, and it appears that the plant is identical with that described by Dr. Houlton.—Ed.

A stout frame of wood must be made about three yards long (or any length that would be most convenient), and about one yard and a quarter wide. Within this frame must be placed two sides of another frame running longitudinally and across, so fixed in the outer frame that the two pieces may slide, independently of each other, backward and forward about six inches.

Tapes of canvass must be tacked round the inside of the inner frame and the corresponding sides of the outer frame, so as to form a square for the material to be sewed in; which when done, the two loose frames must be drawn tightly to the outer, by means of a twine passed round each, in order to stretch, perfectly free from irregularities, the silk or satin previous to laying on the composition.

To make the India-rubber plaster:—Dissolve India-rubber in naphtha, or naphtha and turpentine, and lay it on with a brush, on the opposite side to that which is intended for the plaster, and when perfectly dry, and the smell in a great measure dissipated, it will be ready for the adhesive material; to make which—take equal parts of Salisbury glue, or fine Russian glue, and the best isinglass, dissolved in a sufficient quantity of water over a water-bath, and laid on with "a flat hog-tool" while warm. It is requisite to use great caution in spreading the plaster evenly, and in one direction, and a sufficient number of coatings must be given to form a smooth surface, through which the texture of the fabric is not perceptible. Each coating should be perfectly dry before the succeeding one is given, and placed in a situation free from dust, and where a draught of air would facilitate the drying. The quantity of water used, and the weight of the two materials, must be a little varied according to the season, and the gelatine strength they possess.

Lastly, the plaster being ready to receive the polishing coat, which gives also the balsamic effect to it—a preparation is made in nearly the same manner as the tinctura benzoini composita of the Pharmacopœia, with the addition of more gums; this preparation must be laid on once only, and with a brush kept for the purpose. For making plasters on coloured silk, it is only necessary to select the silk a shade deeper than the colour required, as the plaster causes it to appear a little lighter.

The process being finished, the plaster must be cut out of the frame with scissors, as near to the canvass to which it is sewed as it will admit. For sale, it is cut up in squares, which is best done by means of a compass and rule.

I have tried various solvents for India-rubber, and find none answer so well as those above mentioned. Ether dissolves it with facility, and possesses the advantage of cleanliness, but it is

much more expensive, and evaporates so rapidly, that it is almost impossible to spread the solution smoothly on the silk; naphtha evaporates more slowly, and is, therefore, preferable, but the quality requires attention, as it may be obtained almost free from that kreasote smell which is the only objection to its use. The addition of a small quantity of spirits of turpentine facilitates the solution of some specimens of India-rubber. The white India-rubber is better than that which has assumed a black colour by exposure to the air.

I have tried various adhesive materials, but find the one I have mentioned to be the best. The grand arcanum in making court-plaster is *glue* and *isinglass*. The polishing coat is not absolutely necessary, but it improves the appearance of the plaster, and the gums may probably increase its healing property, and by giving it a more even surface cause it to adhere more closely. It has occurred to me, that a similar plaster might be made for common use with calico instead of silk, which might, in some cases, supersede the use of strapping; and also that the adhesive material might be made the vehicle for cantharidine or other stimulants. The isinglass plaster is apt to crack in warm dry weather, but this does not occur if it is kept in a cellar in an earthenware jar.

1, *Great Homer Street, Liverpool.*

ON THE PREPARATION OF UNGUENTUM SABINÆ.

TO THE EDITOR OF THE PHARMACEUTICAL JOURNAL.

Sir,—Permit me, through the medium of your Journal, to convey to Pharmaceutists, a caution against preparing the ceratum sabinæ in copper vessels, a practice I am authorized in believing to be very general, from the uniformity of the *peculiar* green colour which the cerate constantly presents, as well as from having ascertained that this is due to a salt of copper, formed during the preparation of the cerate. Its presence is readily evidenced by any of the usual tests for this metal.

When the cerate is prepared in a porcelain vessel, by means of the water-bath, it is of a yellowish green, and has not so much of the odour of the plant, but it is equally powerful and efficient; it keeps much longer, without change of colour, or becoming rancid.

Believe me to remain, Sir, yours faithfully,

J. Toller

Conduit Street, 19th December, 1842.

ON MISTURA CAMPHORÆ AND CONCENTRATED CAMPHOR JULEP.

TO THE EDITOR OF THE PHARMACEUTICAL JOURNAL.

SIR, *Ashford, Kent, Nov. 15th*, 1842.

SOME remarks having recently appeared in your Journal relative to the mistura camphoræ, I have been induced to communicate the following short paper on the same subject:

Camphor mixture was first introduced into our Pharmacopœia in the edition of 1745, where it appeared under the title of "Julepum è Camphorâ."

Bate, in his Dispensatory, directs camphire set on fire to be repeatedly quenched in water, in order to communicate its virtues thereto.

The Pharmacopœia Londinensis of 1745 orders sugar to be rubbed with the camphor, and *boiling* water to be added. The sugar was intended to assist the solution of the camphor (I presume by minutely dividing it), and to cover its bitter flavour.

Camphor mixture, prepared according to the formula at present found in our Pharmacopœia, should contain one grain of camphor in the fluid ounce.

Dr. Paris, in his Pharmacologia, mentions half a grain as the maximum.

Your correspondent "B." says one grain.

Dr. A. T. Thomson, in his Conspectus, p. 86, quotes one grain and one-sixth.

From the words used by a writer in a recent number (III.) of the "Annals of Chemistry and Practical Pharmacy," it might be inferred, that the whole thirty grains ordered in the college formula were dissolved by the water, but this any Druggist's apprentice could at once contradict, about ten grains always being left on the filter.

The mean of several carefully-conducted experiments gives me,

gr. xx. in an imperial pint, or
gr. j. in a fluid ounce.

Note.—The P. L. orders "aqua," and not "aqua destillata," as some who have written on the subject would have it. If more spirit is used than mentioned, of course more camphor will be taken up, and the result will be incorrect.

It is a very difficult matter to determine the *exact* quantity of camphor which remains undissolved by the water, on account of its volatility; whatever method be employed, it can only be said to be an approximative one. This, together with a variable quantity of spirit having been used, may account for the dissimilarity of the results above quoted.

A few words with regard to a "concentrated camphor julep," of which your correspondent "B." speaks. From the remarks made by him I should presume that he was not actually engaged in the retailing of medicines over the counter, or he would know that it has become absolutely necessary for a "Chemist and Druggist" to keep an article under the above name, it being frequently required by the public, and for the fitting up of medicine chests, &c.

The principal points to be attained in preparing a "mistura camphoræ concentrata" are three:

1st. It must be perfectly colourless.

2d. It must contain as little spirit as possible.

3d. When mixed with the due quantity of water, it must approximate as closely as possible to the camphor mixture of the London Pharmacopœia.

The first formula, I believe, ever published appeared in Bateman's Magnacopia, edit. 1836. This has been frequently copied. The form Mr. Ladbury favoured you with (*vide* p. 170) is the same, save that he has reduced the proportion of the spirit of camphor from 12 ounces to 3,—for what purpose I know not. I need scarcely say that a mixture prepared from this receipt partakes more of the character of *myrrh* than *camphor*.

After repeated trials of various formulæ, to all of which there appeared some objection, I have found the following to be the best adapted for practical purposes.

MISTURA CAMPHORÆ CONCENTRATA.

℞ Tinctura Camphoræ, P.L., f℥j. ℥v.
* " Myrrhæ Pallidæ. ♏xxx.
Spiritus Vini Rectificati ad f℥iv. M,
f℥iv. ad f℥xvj. Aquæ Puræ = Mist. Camph.

Note—If absolute alcohol is employed, a less quantity will be required.

* TINCTURA MYRRHÆ PALLIDÆ.

℞ Tincturæ Myrrhæ P.L., ℥iij.
P. Carbonis Animalis, ℥j.

Digest for fourteen days, frequently shaking, then filter.

The best method of mixing this is to measure the requisite quantity of water *first*, and then add the solution of camphor to it.

Those who object to the addition of the myrrh, though in so small a quantity, may omit it; but a solution so prepared does not mix so readily with water—it is some time before the whole of the camphor is taken up.

Undoubtedly, there is something mysterious in the action of myrrh on camphor, which, I believe, has not yet been satisfactorily explained. We know for a certainty that the large quantity of spirit present in all concentrated camphor mixtures is the imme-

diate cause of the ready solution of the camphor in the water, but still the myrrh in some way or other materially assists the *rapidity* of the action.

A camphor mixture made with the foregoing essence contains .76 of a grain of camphor in the fluid ounce, equivalent to rather more than $\frac{3}{4}$ of a grain. This, although somewhat deficient, is, I think, as near an approximation as can be obtained without unduly increasing the quantity of the spirit.

Far be it from me to advise the substitution of this for the authorized camphor mixture, yet there are times and seasons in which even a *conscientious* Chemist and Druggist would not scruple to employ the "concentrated infusions," and it is in like emergencies that he would make use of a "concentrated camphor mixture."

I am, Sir, respectfully yours,

JOHN FORDRED.

EXTRACTED ARTICLES.

FURTHER OBSERVATIONS ON THE CHEMICAL CONSTITUTION AND THERAPEUTIC AGENCY OF THE LIQUOR OF HYDRIODATE OF ARSENIC AND MERCURY.

BY PROFESSOR DONOVAN, OF DUBLIN.

[Abridged from the Dublin Journal of Medical Science for November, 1842.]

ABOUT three years since, I introduced to the notice of the medical profession, and gave a process for preparing a liquid compound of iodine, arsenic, and mercury, and proposed it as a remedy in lupus, lepra, and the several forms of psoriasis.

In the *Journal de Pharmacie* for December, 1841, there is a notice of this preparation by M. Soubeiran, containing observations on its chemical constitution and preparation. He states that, being instructed to prepare a quantity of this liquor for the use of the Hôpital des Vénériens, he repeated my process many times, but never with success, some arsenic always remaining undissolved.

In these trials, he followed the instructions given in the French translation of my memoir, which appears to be accurate in all respects but one. I directed a certain measure of alcohol: M. Soubeiran quotes "a little alcohol." Trivial as this difference appears to be, it may cause a failure. The alcohol must be in such quantity as will not too quickly evaporate and leave the mass dry before the elements have united perfectly. Any abridgment of the time during which the trituration ought to be continued, tends to leave undissolved arsenic; and if the alcohol be diminished, so also is the time of trituration. In this way M. Soubeiran may have been misled by the French translation. After having manufactured several hundred pounds of the liquor of hydriodate of arsenic and mercury, I am prepared to affirm, that if my original instructions be exactly complied with, and with pure materials, the process will not fail, and the residuum left undissolved will not exceed $\frac{1}{355}$th of the whole weight of ingredients employed. Thus, when, for the sake of exact observation, I prepared five wine pints, the residuum, when perfectly dried, weighed but two grains; although previously to filtration it was very voluminous. When those two grains of residuum were introduced

into a sealed tube, and the sealed end was heated until the glass began to melt, not a particle of arsenic sublimed; and when the matter was withdrawn, mixed with black flux, and again heated until the glass began to melt, nothing sublimed that was easily discoverable by the unassisted eye; but a magnifier showed a few exceedingly minute globules of mercury, along with a narrow band of a bright film, so thin, that I could not clearly determine whether or not it was metallic. Even if it were, the quantity of arsenic could not exceed one-tenth of a grain. To succeed so perfectly, long-continued incessant trituration of all the solid materials with the alcohol is required. It is no wonder, then, that two grains of residual impurities, or even more, should remain after the solution of so large a quantity as 713 grains of solids.

M. Soubeiran, finding that the whole of the arsenic did not dissolve, supposed that the ratio of iodine directed in my memoir is insufficient to form those iodides which are proper for entering into combination; for he says, that the quantity of iodine "is nearly sufficient to form biniodide of mercury." I founded my estimate of the iodide of arsenic on the calculations and analysis of Plisson; and of the biniodide of mercury on the analysis of Gay Lussac, adopted by Dr. Thomson. It will be found that the quantity of iodine directed in my original memoir, corresponds with the estimates given by these chemists; and experiment has convinced me, over and over, that it is sufficient for effecting a solution of the active ingredients, provided the proper precautions are taken. Thus the quantity of the respective articles employed by me were,

	Grains.		Grains.	
Arsenic	6.08	+ Iodine	30.24	Plisson.
Mercury	15.38	+ Iodine	19.38	Gay Lussac.
Total Iodine			49.62	

I employed fifty grains for the sake of round numbers. M. Soubeiran, in preference to my method, recommends iodide of arsenic and biniodide of mercury to be dissolved in boiling water; he finds that they dissolve perfectly. Yet between this method and mine there is no difference in the ratio of materials employed; for calculating from data contained in his memoir, the quantity of iodine necessary for the above mentioned quantities of arsenic and mercury would be as follows:

Arsenic	6.08	+ Iodine	31.70
Mercury	15.38	+ Iodine	19.12
Total Iodine.....			50.82

which is within a grain and one-fifth the same as I employ; and the only difference is, that he uses the two iodides ready formed, while I form the same substances extemporaneously. If his method succeed, so *must* mine, if the precautions suggested by me be adopted.

M. Soubeiran has been at some pains to reconcile the incongruity obvious throughout my original memoir, of representing the red biniodide of mercury by the name of iodide, and its corresponding peroxide as the protoxide, although the biniodide and peroxide were evidently intended, as appears by the ratio of iodine directed. He truly observes, that none other than the biniodide will enter into the combination; and politely abstains from remarking on this singular inadvertence, further than was necessary to relieve himself from the embarrassment which it occasioned.

Dr. Kane, in his "Elements of Chemistry," page 765, observing upon this liquor, affirms, that its component parts are not in a state of chemical combination; for "the iodide of arsenic being decomposed by the water, the iodide of mercury is dissolved by the hydriodic acid formed, whilst arsenious acid exists free in the solution."

This opinion appears to have been negatived by the researches of Plisson; and to these I shall refer in preference to my own inquiries. It is a fact stated in chemical works, that iodide of arsenic, when acted on by water, affords an acid liquor consisting of hydriodic and arsenious acids. But that the arsenious acid should exist *free* in the solution, there is no warrant for admitting; for although arsenious acid acts the part of an acid much more frequently than that of a base, yet it is still a metallic oxide, and in that capacity does sometimes enter into combination as a base, although with very feeble saturating powers.

That it is in a state of combination in the present instance, and no f ree, appears to be clearly proved by Plisson in the following statements:

"In contact with water, the iodide of arsenic presents phenomena which vary with the ratio and temperature of the water employed. If cold water be used, in quantity incapable of dissolving all the iodide, the water is undoubtedly decomposed, since it forms a soluble acid-hydriodate, and an undissolved sub-hydriodate. But if the cold water be in quantity sufficient to dissolve the iodide completely, a yellow solution results, which I consider rather as a *neutral hydriodate* than as an iodide in simple solution, although the liquor strongly reddens tincture of turnsol—a fact which I explain by the weak saturating property of oxide of arsenic. This oxide being moderately soluble, some persons have thought that the above-mentioned solution was but a simple mixture of hydriodic acid and free oxide of arsenic not combined: here are the experiments which I have made to establish the contrary:

"1. This solution, contained in a bottle exposed to air, and always maintained at the same degree of concentration, does not exhale the odour of iodine; it preserves its amber tint, and does not disengage any vapour capable of colouring the hydrate of starch.

"2. If the experiment be repeated, adding to the solution some hydrochloric acid; the yellow tint, after thirty-six hours, becomes deeper; and the starch, suspended at the mouth of the bottle, begins to become blue. After some days the iodine becomes sensible even to the smell.

"3. In fine, the solution is yellow, and not colourless, which it ought to be if it represented a mere simple mixture of acid and oxide."—*Plisson Annales de Chimie et de Physique*, xxxix. 265.

These facts seem sufficient to refute the opinion of Dr. Kane, that the iodide of arsenic is resolved into hydriodic acid and *free* arsenious acid. The constitution best supported, most generally entertained, and most conformable to the theory of the hydracids seems to me to be, that the compound in question is what its name expresses, a liquid hydriodate of arsenic and mercury, a combination of two oxidated metallic bases with one acid. If iodide of arsenic be converted, by solution in water, into hydriodate of arsenic, the mercurial iodide should, by solution, be equally converted into hydriodate of mercury. That the two solid iodides combine there can be no doubt, for the reasons formerly assigned by me; and that such a combination exists is also the opinion of Soubeiran, who has given it the name of iodo-arsenite of mercury.

It is scarcely worth while to observe on the colour of the liquor of hydriodate of arsenic and mercury. I had described it as yellow. Dr. Kane says it is colourless, but that it soon becomes yellowish-brown by the decomposition of hydriodic acid. During an extensive manufacture of it, I have never procured it colourless, except when the process failed. With me it has always been of a light yellow hue from the first; and so far is it from *becoming* yellow, that, when its colour was purposely deepened by dissolving in it an excess of iodine, a short exposure to light was sufficient to restore its original pale yellow tint. The liquor is also yellow when made according to Soubeiran's process.

[To be concluded in our next.]

OIL OF MADIA SATIVA.

The oil of the seeds of this plant, now extensively cultivated in France, will yield, according to the observations of Braconnot, a solid soap, similar to that made of olive oil. I have occupied myself also with the examination of the fat acids contained in madia oil; I obtained therefrom as well a solid as a fluid acid. The solid one is probably palmic acid, it fuses at exactly 140° Fahr., and contains,

Carbon	74.2
Hydrogen...	12.0
Oxygen	13.8
	100.0

The acid which is fluid at common temperatures, was examined by me, and its properties resemble that of the oleïc acid, discovered by Chevreul; it seemed to me to dry easily. Its composition, however, is not quite that of oleïc acid, as it contains,

Carbon	76.0
Hydrogen...	11.0
Oxygen	13.0
	100.0

Boussingault Comptes Rendus, Mars, 1842.

DIFFERENCE IN THE BOILING-POINT OF DIFFERENT FLUIDS.

Professor Marcet, at Geneva, making experiments on the temperature at which fluids boil in vessels composed of different materials, has arrived at the following results:

1. The boiling-point of distilled water in glass flasks, varies from 212¼° to 215° Fahr., according to several circumstances, especially the different quality of the glass.
2. Of whatever material the vessel may be composed, the temperature of the steam arising from the boiling water is constantly lower than that of the boiling fluid.
3. Contrary to the generally-received opinion, metallic vessels are not those in which water may be made to boil at the lowest possible point, under a given atmospheric pressure. In fact, in a glass flask covered with a thin coating of sulphur, shellac, or any other similar substance, ebullition will take place at a temperature about the tenth of a degree lower than the boiling-point in metallic vessels.
4. In glass vessels which are perfectly clean, and free from any adhering foreign matter, water or alcohol may be heated, without boiling, to a temperature much higher than has hitherto been thought possible; thus, we are enabled to heat water to 221° Fahr., without its entering into ebullition, by previously removing, by means of strong sulphuric acid, all impurities from the glass vessel in which it is contained.—*Echo du Monde Savant.* 1842. *No.* 722.

ON THE DANGER OF KEEPING MILK IN VESSELS OF ZINC.

BY DR. ELANES, OF BERLIN.

I scarcely could have believed that zinc vessels could again have come in use for keeping any fluids used for alimentary purposes, as Vauquelin proved forty years ago, that such will contain, after a short time, a consider-

able quantity of zinc in solution. I have found, by experiment, that a solution of sugar, which had stood only a few hours in a zinc vessel in the summer, contained a considerable amount of zinc salts. It has been often stated, that the cream will separate more easily from milk if the latter be kept for a short time in zinc vessels. As, however, it is known that milk will become much sooner acid than a solution of sugar, it is the more to be apprehended that some zinc will be dissolved, and such milk will be the more noxious, as it is well known that even a small amount of zinc will cause violent spasmodic vomiting.—*Gewenb-blatt für Sachsen.*

DEVELOPMENT OF FERRIC ACID BY ELECTROLYSIS.

BY G. MACKRELL, ESQ.

The object of this communication is to state the means by which this compound was obtained.

I first endeavoured to obtain it, by using a Daniell's battery of twelve cells, four-inch flat plates, placing the solution of potash in a glass containing about a quarter of a pint, into which the electrodes were immersed, the positive being of cast iron, and the negative of platinum ; but in this instance, although the colour was obtained, it was almost immediately decomposed by its near vicinity to the negative plate ; to obviate this it was considered that a diaphragm decomposition apparatus, or a *U* tube, might be successfully employed in obtaining the object of research, and having the latter conveniently at hand, it was used for the electrolysis of the fluid. The disengaged oxygen and hydrogen were here prevented interfering with each other, and the colour was immediately developed around the positive cast-iron electrode, of a beautiful wine-red hue, which became darkened, as the action was allowed to continue, until it assumed almost a black colour, but at the edges of the tube its richness of tint was still apparent. An attempt was made to insulate the acid, by removing it from the tube with a glass syringe, and passing it into a phial with a glass stopper, excluding the air. After a few hours, the solution lost its colour, throwing down a reddish precipitate.

Several specimens of cast iron were used, such as pieces of broken machinery, household utensils, cast iron nails, &c., and in every instance with success : the colour was also procured with a piece of iron wire ; this wire has become very hard and brittle, perhaps from hammering when cold, or from having been heated and suddenly cooled ; its fracture when broken, was crystalline, resembling more the appearance of cast than wrought iron. Various descriptions of soft iron were used, but without success, neither was the colour procured, when steel was employed at the positive pole.

Platinum, or copper, or iron, may be used as a negative electrode, without having any influence on the results.

The solutions in which the ferrate was developed, were,

One part of *potassa fusa* and four parts of water. The same, with a small quantity of solution of nitre in the arm of the tube, in which the negative pole was emersed. The *liquor potassæ* of the shops ; the *liquor sodæ*, with which the colour exhibited an amethyst hue.—*Proceedings of the London Electrical Society.*

NEW METHOD OF PREPARING CINNAMIC ACID.

BY MR. G. HEAVER.

Having recently had occasion to prepare, amongst other chemical products, a quantity of cinnamic acid, and finding that Turner's process for making it from oil of balsam of Peru, was a tedious and expensive operation, and that the product was exceedingly small in proportion to the

quantity of balsam employed, I was led to make some experiments with a view of preparing this acid more economically. This I soon found might be effected by distilling genuine balsam of Tolu, the price of which is now very low. On subjecting this article to a gentle heat in a retort, it fuses, and a little water and fragrant volatile oil first come over ; these are succeeded by the cinnamic acid, which distils over in the form of a heavy oil, condensing in the cool part of the neck of the retort into a white crystalline mass. This gradually becomes contaminated with an empyreumatic oil, that rises towards the end of the operation. The acid may be freed from this oil by pressure between folds of filtering paper, and afterwards dissolving in a large quantity of boiling water, from which it deposits, on cooling, in minute colourless crystals.

This process is very productive, so much so, that the balsam of Tolu I employed, yielded an eighth of its weight of pure acid—minus a few grains.—*Annals of Chemistry and Practical Pharmacy*.

MEZEREON CERATE.

The following formula is given by Mr. Pleischl for the preparation of this cerate.

Digest the fresh bark of mezereon, collected at the period of inflorescence of the plant, in spirit of wine, for two or three days, pour off the liquor and add fresh spirit, repeating this process until the bark is exhausted of its soluble parts. Mix the liquors thus obtained together, and submit them to the action of hydrate of lime, prepared with three parts of water to one of quick lime. The hydrate of lime should be used in the proportion of one part, by weight, to three parts of mezereon. Digest these together until the colour becomes a yellowish green, then distil off the greater part of the spirit. Add water to the residue, when a green substance of a soft consistence will be separated, and one part of this is to be mixed with four parts of yellow wax, and eight parts of olive oil, to form the cerate.—*Buchner's Repertorium.*

APPLICATION OF THE RESIDUE OF IRON PYRITES, EMPLOYED IN THE MANUFACTURE OF OIL OF VITRIOL.

BY M. BERRAEL.

The manufacture of oil of vitriol from iron pyrites, in the countries in which this substance is abundant, being advantageous in a commercial point of view, it is important to discover a profitable application for what has hitherto been considered as the refuse of the process.

In a manufactory in Belgium, where sulphuric acid, and also soda is made, the residue left after burning the pyrites, and which contains sulphate of iron, is mixed with sea salt in excess, and heat applied in a proper apparatus ; hydrochloric acid is thus obtained, and sulphate of soda, which is purified by solution and crystallization. The remaining peroxide of iron is separated, by washing, into two parts: that which is in the finest powder, being dried and mixed with grease, is used as an anti-attrition for machinery, and answers the purpose well ; the coarser powder is made into small pellets, dried and treated as iron ore.

In manufactories where soda is not made in connection with sulphuric acid, instead of extracting the sulphate of iron from the burnt pyrites, it is found more advantageous to distil the residue (the sulphate of iron being already dry) so as to obtain the fuming acid.

It is easy to arrange the apparatus in such a manner, that the sulphurous acid resulting from the decomposition of a part of the sulphate during the distillation, may be conducted into the leaden chambers. Nothing is lost in this process, the residue being obtained in the state of colcothar.—*Comptes Rendus.*

REVIEWS.

On Gravel, Calculus, and Gout, *chiefly an Application of Professor Liebig's Physiology to the Prevention and Cure of these Diseases.* By H. Bence Jones, M.A., Cantab, Licentiate of the College of Physicians, Member of the Chemical Society of London. *Taylor and Walton,* 8vo.

The phenomena of life in the vegetable as well as in the animal kingdom, are due to the manifestation of a certain extraordinary power under whose agency the structure of the plant or the animal gradually increases in volume and weight by the addition of new matter introduced from without, which thus becomes part and parcel of the living system, each separate cellule so generated, becoming in its turn a new habitation of the powers spoken of.

To this power, in its nature utterly unknown, we are constrained to give a name, we may call it the "*vis vitæ*," the "living formation principle," or, as Liebig has done, "the principle of vegetative life," since it is in plants that we see it in its simplest and most energetic form.

The experience of ages has shown in the most striking manner the inutility of forming conjectures respecting the abstract nature and mode of operation of this great principle of organic being; and if it be fair, from a review of the past, to carry onwards our thoughts to the future, we may rest pretty well assured that the eyes of man, in this stage of his existence at least, will never be gratified by a revelation of this mightiest of nature's secrets.

If, however, the investigation of the great principle itself be thus barren and profitless, such is very far from being the case when we come to study its workings and operations upon the various tangible and material substances which enter into the composition of vegetable and animal structures, and which are thus brought as it were immediately under its influence. To study the relations which the different modifications of matter bear to each other in their chemical and physical capacities, when impressed by the ordinary form of inorganic nature, and to observe the changes these undergo when within the sphere of the vital force, is an inquiry which is legitimately included within the province of physiological chemistry, an inquiry important alike in the magnificent views which it is even now unfolding, and in the practical application of the principle thus brought to light to the purposes of our daily existence, and the mitigation or even cure of some of those physical calamities which often render life a scene of almost unmitigated suffering.

It is to Professor Liebig that the honour is due of carrying

into the hitherto imperfectly conducted inquiries of the physiologist, the rigid and careful methods of investigation which the Chemist has long been accustomed to use; the "quantitative" plan of research has already in his hands been crowned with at least one result equally brilliant and substantial; we allude to the recent experiments on the composition of the food of man, and of the higher classes of animals generally; a kind of first-fruits of what may hereafter be expected from a persevering extension to other and as yet only partially understood portions of the subject of this truly Baconian principle.

Certain diseases connected with derangements of the urinary secretion have long been remarkable for their painful and usually intractable nature: it is upon some of these that new agents put by the Chemist into the hands of the medical man are likely to be first successfully exercised. The connexion between gout and many rheumatic affections, and that particular state of the system in which uric acid is generated in the body in unnatural quantities, has long been recognised; deposits from the urine of the same substance, or its ammonia salt, in the form of gravel or fine powder, or fortunately, more rarely, solid calculus, have long been familiar to the medical observer, it is only recently however, that the cause of these phenomena has been at all satisfactorily traced.

The materials of which the animal body is composed, are in every moment of its existence undergoing chemical decomposition, through the agency of the oxygen of the atmosphere, which, being absorbed by the blood, is carried in an active state to every part of the system, and thus made to produce its well-known effects in the most complete and perfect manner that can be conceived. The body is in fact burning away at a low temperature, like a stick of phosphorus exposed to the air; fat and muscle and nerve successively give way before it, while the carbonic acid and the water produced by this incessant combustion find their way out by the lungs and skin. It is by this continual burning, that the temperature of the body is kept up, and it is to supply this never-ceasing loss of matter from every part of the system that we are compelled to have recourse to food. But muscle and nerve and membrane contain nitrogen as well as carbon and hydrogen. How does this substance make its exit from the body? By the urinary secretions, in the state of urea or carbamide—a substance which only requires the addition of the elements of water to become carbonate of ammonia.

Now it happens in certain states of the body, that this natural process of oxidation is impeded; there are various causes which may bring about this, and the result is the abundant appearance in the system of *only partially oxidized substances*, which, in a

better state of things, are found in very small quantities, or not at all. The most common of these half-burnt bodies is uric acid, and thus we get what is called the uric acid diathesis.

Again: it may happen, although more rarely, owing to peculiar circumstances, such as long use of particular kinds of food, or natural disease, that oxidation takes place too powerfully, and substances are burned which were not intended to be so treated. In this state of things, the urine is often secreted alkaline from the complete destruction of the organic acids, and the tendency to deposit earthly phosphates is observed, partly arising from the unusual abundance of these salts, and partly from want of acid solvent. This is a condition exactly the reverse of the former; we may call it the alkaline or phosphatic diathesis.

These few remarks will serve to render intelligible the general plan of the work now before us, and to give an indication of the line of treatment proposed in these two great divisions of calculous disorders.

The following is the author's definition of Gout:—

"An inflammation in parts in which the usual changes which the oxygen effects, are unable to take place, in consequence of an excess of the non-nitrogenous principles in the body."

Contrast this condition with its opposite, Scurvy:—Dr. Jones has just been describing the effect of large doses of common salt, and its power of rendering the blood more than usually alkaline from its decomposition in the body, and the incessant tendency to oxidation somehow connected with this state:—

"The effect of salt in promoting the action of oxygen on the substances in the body is seen in the fact, that no animal can be fattened if it is able to obtain much salt; and the experiment used to be fearfully tried in the navy. The habits of sailors when on board ship, excepting only their spirit drinking, are exactly those which promote the action of oxygen in the greatest degree; and when long fed on salt meat, which furnishes an abundant supply of alkali to the blood, whilst they are deprived of non-nitrogenous food, an excessive action of oxygen on the tissues of the body takes place, and when this is long continued the scurvy appears, the salt hastening the rapid changes in the tissues. Very soon after the discovery of oxygen, and when the study of organic chemistry was scarcely begun, when vegetables were thought to be a means of supplying oxygen to the body, a want of oxygen was said to be the cause of sea-scurvy.

"By diminishing the amount of alkali in the blood, and by giving non-nitrogenous food, the scurvy is cured or prevented, in consequence of such substances being acted on instead of the tissues of the body. No other explanation can be given of the benefit which arises from vegetable acids, from fresh vegetables, from sugar, wine, beer, wort, treacle, potatoes, &c., all which have been used with the best effects. It is also a striking fact, that the scurvy makes its appearance after a storm, when the seamen have undergone violent exercise. * * * In all respects the scurvy may be looked upon as exactly the converse disease to gout, and the freedom of sailors from calculous affections,* not one case of stone occuring from 1816 to 1829, in which time there were 331,000 men employed in the naval service, is explained by the causes which render them liable to scurvy.

* Medico-Chirurgical Transactions, vol. xvi., p. 103.

The observations on the occasional occurrence of oxalic acid in the urine are very important; it is likely to be much more frequently met with than is commonly supposed. Dr. Jones acknowledges, on his title-page, having borrowed the principal materials of his volume from the recent publication of Professor Liebig, but the attentive reader will discover abundance of valuable additional matters not to be found in the admirable work referred to, and among these, not the least interesting, will prove a short but excellent notice of the progress hitherto made in the endeavour to obviate the ordinary cutting or crushing operations for the stone, by the use of various solvents introduced into the bladder; an attempt, if successful, of incalculable benefit to the numerous individuals suffering from one of the most painful diseases to which man is liable.

In thus expressing our opinion of the practical value of this publication, it is satisfactory to find ourselves supported by Professor Liebig himself, under whose immediate superintendence and sanction, a translation into German is now preparing.

Handbuch des praktischen Arzneimittellehre für angehende, praktische und physikats-ärzte so wie als leitfaden für den Akademischen Unterricht. Von J. F. Sobernheim, M.D., &c.

[A Handbook of practical Materia Medica, intended for Students and practical and philosophical Physicians, as well as a Guide for Academical Instruction]. 4to, pp. 474. Berlin, 1841.

A QUARTO volume of nearly five hundred closely printed pages, scarcely comes up to an Englishman's ideas of a "Handbook" or "Manual," which Dr. Johnson defined to be "a small book, such as may be carried in the hand." It certainly cannot be called a "handybook."

Dr. Sobernheim's work is divided into two parts. The first occupies eighty-seven pages, printed in double columns, and is devoted to the physiology of the effects of medicines, founded on the latest information in the departments of the history of developments, physio-pathology, and organic chemistry. It embraces a variety of details on matters of an interesting nature, but many of which we, with all deference to the author, think out of place in a work on pharmacology. That part of the article which relates to the action of medicines is, however, ably executed, and contains references to all the latest works and papers bearing on the subject.

The second part of his work is devoted to special pharmacology. In this the author gives, in a tabular form, a condensed summary of the most important points relating to medicines. This part of the work greatly resembles, and is obviously founded on the plan of Schwartze's *Pharmakologische Tabellan*, a ponderous folio, the second edition of which was published at Leipsic in 1833.

The following is an extract from a letter lately received from Mr. William Hodgson of Philadelphia: "The Pharmaceutical Society seems to prosper greatly as to numbers, and judging from the Journal there seems to be a healthy spirit of research springing up among your younger members. I think you will find the lectures in the school of Pharmacy a great advantage to the Apprentices. This at least has been the case with us. The young men have thus had an opportunity of systematizing their study of Pharmacy and Chemistry, instead of pursuing it in the old loose and random way, in which they could merely touch upon the prominent points of the sciences allied to our art, without deriving much practical or substantial benefit. Now, our Apprentices, unless it is their own fault, are sent out, to a considerable extent accomplished Pharmaceutists."

Mr. Joseph Leay inquires, What quantity of syrup should be added to a drachm of the powder to form Confectio Opii? The College directs the powder (7 oz.) to be kept in a covered vessel, "and whenever the confection is used, add sixteen fluid ounces of syrup made hot, and mix." Supposing sixteen fluid ounces of syrup to weigh nineteen ounces Troy, the quantity required for a drachm of the powder is 162.8571 grains. The peculiarity of the College instructions consists in the fact that the syrup is to be added whenever the confection is used, and that whenever the confection is used *sixteen ounces* are to be added.

The most convenient instrument for taking specific gravities is a hydrometer. Bottles are also made to contain 1000 grains of distilled water:—when filled with any other fluid, the number of grains of that fluid represents the specific gravity without the necessity of calculation; for instance, if it contain 850 grains, the sp. gr. is .850, if 1542 grains, the sp. gr. is 1.542.

T. B.—We never heard of worms of stills being made of lead: pewter or tin is generally employed.

"Explorator."—We understand "Pulvis Martialis" to denote oxide of iron.

"An Associate" (Rochdale).—The original Bude light consists of an Argand lamp supplied with oxygen gas instead of common air. The term is sometimes applied to a large gas lamp, with concentric burners, in which common gas is burnt.

"An Associate" (in the City)—*Qu.* 1. The students of Apothecaries' Hall have admission to the Botanic Gardens at Chelsea. *Qu.* 2. Butler, in Covent Garden. *Qu.* 3. It ought not to be necessary to sprinkle a blister with pulvis cantharidis. *Qu.* 4. Disappointments will sometimes occur in the best regulated families.

Mr. Lamacraft suggests that the old names, as well as those now in use, ought to be pasted on the shop-bottles, to assist the memory and prevent mistakes. (There can be no objection to this plan, but in some cases the list of synonymes, unless printed very small, would cover the bottle. We understand that De la Rue is preparing chemical tables, with synonymes, symbols, and atomic weights).

"A Member" (Swansea) We intend to give an article in reply to the first question next month. We recommend Parnell's Elements of Chemical Analysis, published by Taylor and Walton.

"A Member (Dec. 10th.) The Pharmaceutical Society has no arms at present—the certificate of membership will shortly be issued.

Mr. Owen recommends the appointment of a Committee of the Society to visit the shops of Druggists, as a means of improving our profession.

"Mathematicus," Δ A.P.S. It is a typographical error, *for* 1841 *read* 1842.

T. H. The arrangements for the summer courses of lectures are not yet made, but we believe the lectures on Botany will commence in May.

Concentrated infusions may be made by the process of displacement which has already been described in the Journal, a small quantity of spirit being added to ensure their keeping. It is easy to calculate the proportion, so as to make them of any strength desired It has already been stated that concentrated infusions should not be substituted for those of the Pharmacopœia, except in cases of emergency.

"TIRO DE QUO INQUISITIO SOLET FIERI."—*Qu.* 1. Citrate of Potash is a crystallizable salt; but we believe the compound usually sold under that name, consists of carbonate of soda, tartaric acid, and sugar, flavoured with essence of lemon. *Qu.* 2. The cause of the rotatory motion of camphor, when placed upon water, has not been satisfactorily explained. *Qu.* 3. Some years ago Mr. Battley referred the profession to the London Opthalmic Hospital for the formula for liquor opii sedativus; but it has not yet been found. *Qu.* 4. See the above answer to T. H.

"A MEMBER" (Dec. 8th).—We cannot exactly understand the question; but a ticket for one course of lectures will not admit a student to another course.

G. R. R. Y.—In the year 1831, Dr. Kane, of Dublin, published a very useful work, entitled *Elements of Practical Pharmacy*, 12mo.

A. Z., A. P. S.—Hooper's Medical Dictionary is the kind of work which our correspondent appears to require, for explaining medical terms. Gray's supplement is the best work of the kind which we are acquainted with.

Mr. T. HUNT objects to the formation of the Pilula Ferri Composita at the time it is wanted, on account of the effervescence which takes place, and which he says sometimes causes the pills to raise the lid of the box. (This would not occur if the mass had been properly prepared).

W. L., A.P.S.—The lime water should be used cold.

Θ A. P. S.—The question was answered in the last number.

"AN ASSOCIATE" (Dec. 1st). A person who has seceded from the Society, "may be reinstated on payment of a suitable fine."

R. F inquires, What is the best weekly or monthly periodical for the Dispensing Chemist? Besides the Pharmaceutical Journal, we are only acquainted with the following works of that class: The Chemist (monthly), the Annals of Chemistry (weekly), and the Chemical Gazette (twice a month). Our correspondent can exercise his judgment in the selection.

Blue ink is made by dissolving Prussian blue in a solution of oxalic acid.

A. Z. (Newcastle) complains of the inconvenience arising from the frequent applications of those who are not members for the loan of the Journal, which practice he thinks, "unless speedily checked, will prove very detrimental to the weal of the Society."—We are sorry to differ in opinion from our correspondent, but we are glad to find that the Journal is in request.

T. P. F.—The nature of the deposit in Vinum Ipecacuanhæ is not known. The second question is answered, page 458. Tinctura ferri muriatis, if made *without spirit*, would not be "*a tincture.*"

"A CORRESPONDENT" (Bishop's Stortford) writes for his Journal, but he has forgotten to sign his name.

E. P. S. suggests, that Associates, who come from a distance, should be allowed to pass the major and minor examination at the same time, to save the inconvenience and expense of a second journey.

We recommend Lindley's Elements.

G. H.—The letter shall be referred to the Council.

M. E. JOHNSON. We have seen no work of designs for fitting up a Chemist's shop.

A. Z. (Edinburgh) is referred to a paper by Mr. Squire, On Preparations of Roses, vol. i. p. 585.

W. M. in our next.

A few additional errata in the List have been forwarded to us, which we defer until next month.

Advertisements to be addressed to Mr. CHURCHILL, Princes Street, Soho.

Other Communications to THE EDITOR, 338, Oxford Street (before the 20th of the month, if answers be desired in the ensuing number).

PHARMACEUTICAL JOURNAL.

VOL. II.—No. VIII.—FEBRUARY 1st, 1843.

THE EXAMINATION OF ASSOCIATES.

In order to give an idea of the course of reading and study which ought to be pursued by candidates for admission as Associates into the Pharmaceutical Society, a brief notice of the plan of the examination may probably be useful.

In the first place, the candidate is required to read and translate several Latin prescriptions, giving the terminations of the words, with a literal and explicit interpretation of the directions. He must prove, by the facility with which he performs this elementary exercise, that he is familiar with the technical terms, and the vocabulary of the Latin language, and, consequently, competent to take the first step in preparing prescriptions — namely, to read the instructions of the Physician.

The next subject of examination is the Materia Medica. A variety of articles are on the table—barks, roots, gums, fruits, seeds, leaves, resins, &c. &c. none of which are labelled; and the candidate is expected to select from among the number, any specimen which may be called for, or to mention the name of any which may be pointed out. He is questioned as to its nature and properties; the part of the world whence it is procured; the animal or plant, as the case may be, from which it is derived; and any other particulars which are important in its natural history and application to Pharmacy. The metals, earths, alkalies, acids, salts, and other substances used in medicine, are included in this part of the examination.

The distinguishing characteristics of plants, as exemplified by plates or specimens, are to be described, and although Botany does not at present take a prominent place in the examination of Associates, a candidate is expected to be able to recognize the

medicinal plants in daily use, and to describe their leading characters, and the parts of each plant which are used in medicine.

The questions in Chemistry relate to the composition of the various substances enumerated in the Pharmacopœia; the decompositions which occur in the manufacture of chemical compounds, and also in the routine of dispensing business; the leading tests for some of the most powerful poisons, and the modes of detecting impurities in ordinary cases. An acquaintance with the weights and measures is also essential.

The department termed Pharmacy, comprises the manipulation of extracts, infusions, tinctures, and other preparations of the Pharmacopœia, with the application of the knowledge of the foregoing subjects to the dispensing of prescriptions.

Besides the *viva voce* examination, a few questions are to be answered in writing.

With respect to the mode of preparing for this examination the first thing which requires attention is the Latin language and the technical terms used in prescribing. In gaining this knowledge, the work which we recommend is the "Selecta e Prescriptis."

All the other information which is absolutely necessary may be found in the Pharmacopœia. Phillips's translation contains explicit directions for testing the purity of all the preparations. The rationale of each process is explained, as well as the nature and composition of the product and every other particular on which a question is likely to be asked: in the Materia Medica, the botanical names are given. All that the student requires in addition is a *practical* acquaintance with the drugs and compounds. This may be obtained by any apprentice who will take the pains to examine the articles in the shop-drawers, and the herbs, roots, &c. as they come in season, comparing them with the descriptions in the Pharmacopœia.

Those who wish to enter more minutely into the several subjects enumerated, will find Dr. Pereira's Materia Medica an invaluable work. Dr. Thomson's and Dr. Christison's Dispensa-

tories are also extremely useful, not only on account of the general information which they contain, but also from their presenting at one view the Pharmacopœias of the three Colleges. Students in the country enjoy a great advantage in the facility of obtaining plants, and ought to avail themselves of this opportunity of studying Medical Botany. Those who reside in London and other large cities, must resort to the herbalists, and should take advantage of any lectures which they may have the option of attending. The Royal Garden at Kew is open to the public, and contains a very large collection of medicinal and other plants. The operations of the laboratory are particularly instructive and interesting, and every opportunity of assisting in this department should be considered a privilege.

Enquiries are sometimes made, as to the period of time which is necessary for preparing for the examination. This depends very much upon circumstances. A young man who has been industrious during his apprenticeship, and who has had the means of acquiring practical experience in his business, might probably pass the ordeal *creditably* after two or three months of reading and study during his leisure hours. Those who have not been so fortunate, or who have neglected the advantages within their reach should devote a much longer time to this especial object.

The Council could not consistently with the duty they owe to the public and to the society, grant a certificate of qualification to a young man who is palpably ignorant of the rudiments of his profession—who could not explain the difference between calomel and corrosive sublimate, or read an ordinary prescription. At the same time, the examination of which the above is an outline, will not be found particularly formidable by those who have properly studied the Pharmacopœia, as it has already been stated that some allowance is made *at the present time* for the disadvantages under which our students have hitherto laboured; and we may add, that where a doubt exists as to the merit of a candidate, the examiners are disposed rather to give the casting vote in his favour, than to act with undue strictness and severity.

TRANSACTIONS
OF
THE PHARMACEUTICAL SOCIETY.

INTRODUCTORY LECTURE
ON PRACTICAL PHARMACY,
DELIVERED DECEMBER 28th, 1842.

BY MR. THEOPHILUS REDWOOD.

GENTLEMEN,

PREVIOUS to the commencement of the lectures on Practical Pharmacy, which are about to be delivered here, it has been thought not unsuitable for me to offer some introductory remarks on the nature of the instruction they are intended to convey. Until the establishment of this institution, no school had existed in this country for the express purpose of affording systematic education to the Pharmaceutical Chemist. The position which is now held by the Chemist and Druggist has been gradually and imperceptibly acquired; and in proportion as his duties have become more important and responsible, the necessity has arisen for increased qualifications. He is no longer a mere dealer in drugs. In compliance with the necessities and requirements of the public, the practice of Pharmacy has been, in a great measure, consigned into his hands. Thus, called to the discharge of duties involving deep responsibilities, he holds a position in which so much of the tradesman is combined, that it cannot be said to be purely professional; and yet so much of science is required, as to render the calling something more than a trade.

Conscious of the importance of our office, as constituting an essential department in the administration of medicine, we are no longer satisfied to remain inactive, unorganized, and but imperfectly educated, for the duties we have to perform. Hence, within the brief space of a few months, we have seen this amorphous body suddenly assume an organization, the ramifications of which extend through every part of the country. This circumstance affords abundant evidence of the propriety and necessity of the movement which has so simultaneously taken place. Thus, we sometimes find that a saline solution, when fully saturated, requires but the slightest agitation to make it shoot into crystallization; and this effect is not a stronger indication of the saturated state of the liquid than is the sudden and spontaneous formation of a society, constituted as this is, a proof that we were ripe for a change.

But this change consists not in the adoption of a name—it cannot be realized by the mere formation of a society; for as the spontaneity of the movement, which originated this institution, was but the symptom of a disease, so the institution itself is nothing more than the prescription for the remedy; and that remedy is—*education.*

It is only by extending the means of education, and imposing some test by which to judge of the qualification of those who exercise the art of Pharmacy, that we can hope to acquire and maintain that scientific character, as a body, to which, if fully qualified for our duties, we should most undoubtedly be entitled.

The importance of scientific education to the Pharmaceutical Chemist, becomes evident in considering the nature of his occupations.

Were the Chemist and Druggist nothing more than a mere dealer in drugs, no higher qualification would be required in him than the power of judging of the genuineness and quality of these substances. But the art of Pharmacy, which constitutes the most important part of his occupations, consisting as it does in submitting these natural productions to a variety of operations, by which material changes are effected in them, demands an acquaintance with the chemical constitution of these bodies, with the elements of which they are composed, and the laws by which these elements are combined or disunited. And, if we consider the variety of the substances with which the Pharmaceutist is required to be practically and intimately acquainted—if we take into account the number of the chemical elements which constitute these bodies, and the complicated nature of many of the changes which the pharmaceutical processes involve, it will be found that an amount of knowledge is required, which renders the scientific study of the subject essential.

Science is the correct interpretation of nature, founded upon the classification of phenomena, and tending to the establishment of principles; and the distinction between scientific knowledge and that which is merely acquired in the ordinary practice of any art, consists in this, that while the latter refers to individual and unconnected facts, the former presents the phenomena of nature, grouped and arranged according to their relations, and having reference to certain fixed principles, upon which they are explained. Thus, by the aid of science, we are enabled to acquire and retain a more correct knowledge—a more comprehensive and rational view of the works of nature, than otherwise we could.

Now the knowledge required by the Pharmaceutical Chemist, that which is immediately concerned in the practice of his art, may be divided into two principal branches. The one relates to

the natural history, the botany, the mineralogy, the chemical constitution of drugs, and the physical characters by which they are distinguished, and which determine their good or bad qualities—this is called Materia Medica. The other relates to the changes which are effected in these drugs, in order to adapt them for administration—this is called Pharmacy, and it constitutes the chemistry of medicine.

All, or nearly all, the scientific knowledge that we require in our daily occupations as Pharmaceutical Chemists, is comprised in one or other of these two branches of information—it is included either in Materia Medica or Pharmacy. Hence these constitute the most important branches of knowledge to the Pharmaceutical Chemist; they are those which are peculiarly and legitimately his own—those without which he cannot exercise his art with advantage—without which he is not entitled to the appellation of Pharmaceutical Chemist.

Materia Medica comprehends so much of natural history as to afford a knowledge of the origin of the substances employed in medicine; so much of Botany as to enable us to distinguish one plant from another, to distinguish a root from a rhizome, a bulb from a cormus, and to determine the proper period for obtaining the different vegetable products in the state best adapted for medicinal use; so much of Mineralogy as shall constitute a knowledge of our medicinal minerals; and so much of Chemistry as we require to distinguish between one chemical compound employed in medicine and another.

Pharmacy again, comprehends a more extensive acquaintance with chemical science. In this department, a knowledge of the composition of medicinal agents, and of the means by which they are prepared and combined is essential. In the practice of this part of our art, we should view the substances upon which we operate, in reference to their chemical properties, rather than their physical characters. Thus Pharmacy constitutes in fact, a branch of the science of Chemistry.

But Pharmacy is only a *branch* of Chemistry, it does not take in the whole range of that comprehensive science. Materia Medica includes but a small part of the science of Botany, or of Mineralogy, or of Natural History; and he who knows no more of these sciences than what is necessarily comprised in the knowledge of Materia Medica and Pharmacy, will possess but a very imperfect acquaintance with them—will possess, in fact, just so much as will serve to establish the relation of one medicinal substance towards another, but will not show the connection of these substances with others beyond the range of medicinal agents. The Pharmaceutical Chemist should therefore extend his acquaintance with these sciences, beyond the strict require-

ments of his professional qualifications. This is more particularly the case with reference to Botany and Chemistry. Chemistry, indeed, has so important a bearing upon almost every part of our occupations, that it ought to be studied in the fulness of its integrity. A knowledge of Chemistry lies at the very foundation of Pharmacy. It is *the* analytical science, which discloses the intimate constitution of bodies, and gives us that exact knowledge of them, without which, in our pursuits, we should be working in the dark, and blundering at every step.

In establishing a school of Pharmacy, however, it is necessary not only to teach those sciences which shall comprise the requisite information for a practical Pharmaceutist, but at the same time to point out the particular connexion which exists between the science taught, and the art to which this knowledge is applied; in fact, to teach the *art*, by illustrating in its practice the principles of the sciences upon which it is founded.

In this respect, the instruction given here may be expected to differ, in some degree, from that which is given in the same branches of science at the Medical Schools. *There*, the same branches of science are taught as *here*, although many others are added to them; but the object of both teacher and learner is, to connect these sciences with the particular department of medicine which the students in those schools are designed to follow. The same is the case here, but the nature of our occupations, and the necessary qualifications for them, being widely different from those of the medical practitioner, it becomes necessary to shape the instruction given, according to the requirements of the students.

In treating of the substances employed in medicine and their mode of preparation, it is found convenient to divide the subject, and the division which we have adopted is in accordance with that made in the Pharmacopœia, where the drugs in their natural state, or in the condition in which they reach the hands of the Pharmaceutist, are classed together under the head of Materia Medica; while the medicines which are elaborated from these drugs are comprehended under the head of "Preparations and Compounds." The latter of these will be treated of in the lectures on Practical Pharmacy.

A distinction is sometimes made in pharmaceutical preparations, founded on the old division of medicines into *Chemicals* and *Galenicals*, or in other words, into inorganic and organic compounds: Pharmacy being considered as relating to the preparation of the latter, and Chemistry the former. This distinction, however, appears to be unnecessary, and is, in many respects objectionable, being calculated to induce erroneous notions, especially in the mind of the student. The ancients made no pretensions to

the knowledge of organic Chemistry, and, with them, *Galenic* had much the same signification in Pharmacy that *specific* now has in Therapeutics. But, since the days of Galen and his followers, a great stride has been made in the progress of organic Chemistry. We are no longer ignorant of the means of discovering the composition of organic bodies. The greater part of the vegetables comprised in our Materia Medica have been carefully analyzed, and their composition determined with much accuracy; and, although it may not be easy distinctly to define the chemical composition of some of the compounds called Galenicals, yet it is very desirable to bring as much chemical knowledge as possible to bear upon their preparation.

Pharmacy implies the application of chemical science to the preparation of medicines. A knowledge of Chemistry is required in all cases, in order judiciously to devise, and successfully to conduct, pharmaceutical operations; and even those medicines which are supposed to require little or no chemical knowledge and skill in their preparation, will often be found, on careful examination, to involve more intricate constitutional changes, than others which are expressly distinguished as chemical preparations.

Among the class of compounds called Galenical, are the syrups, tinctures, and extracts; and some of these afford good illustrations in support of the remarks I have just made. These medicines are not viewed as chemical compounds, and, therefore, no attempt is made to determine the chemical condition of their constituents, or the changes which take place during their preparation. If they are found to possess the usual physical characters of the class of preparations to which they belong, no further enquiry is made, and thus medicinal agents are employed the composition of which is often entirely unknown. Were the effects of these medicines at all times uniform, it might be considered of little consequence, whether we are acquainted with their chemical composition or not; but it so happens that these compounds are more subject to variation than any others in the whole list of our remedies; and this liability to change is no doubt the result of defective manipulation, arising from our ignorance of their chemical compositions and decompositions.

Sugar is the basis of all syrups; it is this that gives them their distinguishing character. In the preparation of syrups, therefore, we should be acquainted with the chemical properties of sugar, and the changes which it undergoes when exposed to the influence of heat, and the action of those bodies with which it may be combined. We should be acquainted with the extent of solubility of sugar, the phenomena connected with its crystal-

lization, and the influence which the strength of its solution has upon its permanence in the liquid state.

If the chemical composition of a syrup be well defined, we may, without much difficulty, foresee the changes to which it will be subject. Thus fecula, mucilage, and albumen, when in solution, very soon undergo decomposition, and it is to the presence of these substances that the fermentation of our syrups is generally due. Let the means for determining the presence of these, and other useless and prejudicial bodies, and of effecting their separation from the active and valuable constituents of the vegetable matter employed, be made subjects for investigation; they are questions of great interest and importance, and, upon the solution of these, and similar questions, involving some of the most intricate details of practical Chemistry, depends the improvement and perfection of the art of Pharmacy.

As another illustration of the consequence of thus working without reference to the nature of the elements employed, or the products resulting, I may instance the case of the ammoniated tincture of opium of the Edinburgh Pharmacopœia. This tincture is made by digesting opium, saffron, benzoic acid, and oil of aniseed, in spirit of ammonia, and its narcotic effect depends upon the kind of spirit of ammonia employed in making it. The spirit of ammonia of the Edinburgh College, is a solution of caustic ammonia in spirit of wine, while that of the London College, is a solution of carbonate of ammonia in spirit. The ammoniated tincture of opium when made with the latter of these, as it sometimes has been made, contains none of the narcotic principle of the opium, but when made with the former, it is an active and valuable remedy. Now in this case, being acquainted with the composition of the ingredients employed, we can exercise our chemical knowledge with advantage; by means of it, we are enabled to determine the exact cause of the variation in the effects of the medicine, and to guard against a recurrence of the error which had led to it. Was our knowledge in other cases equally exact, the application of it would doubtless be no less effectual.

There is no class of pharmaceutical compounds, which, in their preparation, require more of the knowledge and skill of the practical Chemist than the *extracts*. The acknowledged defects which attach to these medicines, considered in connexion with the present advanced state of organic Chemistry, point out an enticing, though somewhat intricate, field for investigation; and such investigation, if carefully pursued, could not fail to be productive of great benefit, by suggesting improvements in the processes we now adopt.

A vegetable juice, as obtained by expression, consisting, as it does, of the whole of that portion of the plant which is in a liquid state, together, perhaps, with some solid particles forced out by the pressure employed, must, at all times, be a fluid of a very complex nature. It consists of what may be called the food and blood of the plant, that is, the *sap*, the *succus communis*, or that part of the food which is imbibed by the roots, and which consists of water impregnated with carbonic acid, and some inorganic substances; and the *peculiar juice*, *succus proprius*, or assimilated food, which, like the blood in animals, contains the elements for the reproduction and extension of every part of the living fabric. It is this latter part that is imbued with those properties upon which the medicinal effects of the juice, or of the inspissated extract depends. Now, the proportions in which these two parts of the juice of a plant exist, are by no means fixed and uniform; they are most uncertain, depending upon those circumstances which regulate imbibition by the roots, and assimilation in the leaves, and other green parts of the plant. Thus, a continuation of wet and cloudy weather would occasion an excess of unassimilated sap, whilst an uninterrupted succession of heat and drought would give the preponderance to the true juice, or *succus proprius*.

I have found the juice expressed from vegetables to differ materially, according to the period of the day even at which they are gathered. From a bed of lettuces, which were in a state fit for making extract, some of the plants gathered in the evening, just after sunset, afforded a juice, the specific gravity of which, when filtered, was 1.031; while that of the juice expressed from plants gathered from the same bed on the following morning, was only 1.026; and these results were corroborated by frequent repetitions of the experiment.

These varieties in the composition of the juice, arise from a modification of the energy of the vital functions, dependent upon the supply of moisture and the action of the rays of the sun.

When vitality has ceased in the plant, a new set of changes commence: the plant withers, the colours fade, and it is often found that properties, which the living plant possessed, are not to be found in that which is dry and seared. In the living plant, carbonic acid is absorbed, and oxygen gas given off; in the dead plant, oxygen is absorbed and carbonic acid is given off. In both cases the change is expedited by heat and light.

Now, it is from the study of these, and other similar phenomena, that we must seek to discover the principles by which to regulate the processes for the preparation of extracts. If I expose a vegetable juice or decoction to the action of heat in an open pan, it is placed under circumstances the most favourable for promoting

the changes to which I have alluded, and it is generally found that, in these cases, oxygen is absorbed to a considerable extent.

This effect may be obviated by conducting the process in a vessel from which atmospheric air is excluded, and in which evaporation is conducted *in vacuo*. In this case, the substance to be inspissated is placed under circumstances the most favourable to the preservation of the active principles present, in an unaltered condition.

There are other ways in which evaporation is carried on in the preparation of extracts, to which it is unnecessary for me to allude on this occasion, as I have, I trust, adduced sufficient evidence to prove, that something more than a superficial knowledge of Chemistry is required in conducting these operations.

It is evident, from the samples now before me, of extracts prepared by different processes, that the products vary essentially according to the method of operation pursued.

The description of these processes, and the application of the principles of Chemistry in explaining them, will form a part of the subjects to be treated of in the Pharmaceutical Lectures.

It is desirable that every Chemist and Druggist should be acquainted with the processes to which the substances employed by him in medicine have been submitted before their reaching his hands, not merely with the view to his adopting these processes himself, but as the best means of preventing him from becoming the victim of fraud and imposition on the one hand, or a prey to prejudice and unfounded suspicion on the other—two consequences which equally result from ignorance on these subjects.

The wholesale operator and manufacturer has little to apprehend from the encroachments of amateurs in his department. The power which capital affords, and the advantages arising from manufacturing on the large scale, will always secure to the wholesale-man that preference and protection to which he is entitled: and those manufacturers who are disposed to act uprightly in the supply of good and genuine articles, will be more likely to meet with a just appreciation of their conduct, and to obtain a fair remunerating price for their goods, from men who are capable of forming a tolerably correct estimate of the necessary expenses of the manufacture, than from others who are ignorant on this point.

Among the first of the pharmaceutical operations to which we shall have to allude, are those by which the disintegration of bodies is effected. The various processes connected with drug-grinding and pulverization are subjects of considerable interest to the Pharmaceutist. We do not suppose that the effect of describing the apparatus, and explaining the processes by which

drugs are reduced to that beautiful state of comminution in which they are supplied to the Pharmaceutist, will be to induce him to become his own drug-grinder, or that it will operate in any way prejudicially to the interests of those who conduct this branch of business with integrity. On the contrary, the more widely such information is diffused, the more completely will many prejudices be dispelled and unfounded suspicions removed.

But there is much connected with this part of the subject which directly concerns the Pharmaceutist, in the practice of his department of the art, and which many young men who come here may not have had opportunities for learning. For instance, such substances as the metals, zinc, iron, copper, gold, &c. are required to be reduced to a state of fine division, for many purposes for which we employ them; and yet, each of these requires a distinct and different process by which to effect its reduction to the state of powder. Here, again, is a substance, phosphorus, which is occasionally required in a finely divided state. Now, any one who has not been expressly instructed in the method of powdering this substance, would be puzzled to know how to set about it. It is soft and flexible. Put it into a mortar and pound it, and it yields to the impressions of the pestle, like so much wax, but accompanied by phenomena which render it clear that it cannot be powdered in this way. But if we put it into a small flask with some spirit of wine, and then, having melted the phosphorus by the heat of a lamp, continue to agitate the flask until it has become cold, the object contemplated will be effected in the most perfect manner.

If I were to attempt to reduce this piece of copper to powder, by the ordinary methods employed for that purpose with other substances, I should surely fail; but if I first dissolve it in sulphuric acid, and then cause its separation from the acid by immersing a piece of zinc in the liquid, I easily and completely effect my purpose.

These are some of the details of practical Pharmacy, which, although they relate to what may be considered among the most trifling and unimportant operations of the art, and such as may not be very frequently required to be exercised, yet every accomplished Pharmaceutist ought to be acquainted with.

In many other operations that we have to perform, it is necessary to be acquainted with the principles of chemical science, in order to understand the nature of the phenomena which result, and upon this knowledge must the details of the processes be founded. Suppose, for instance, that we are called upon to prepare a persulphate of iron. In conducting this process, it is important that we should understand the nature of the changes which take place. The process consists in converting the com-

mon sulphate of iron, that is, sulphate of protoxide of iron, into sulphate of the peroxide, and this is effected by adding nitric acid to a hot solution of the former salt. Now any one not acquainted with Chemistry, would probably suppose that the nitric acid in this case enters into the composition of the resulting product; or, if informed that the nitric acid is decomposed into oxygen and deutoxide of azote, the former of which combines with the iron to form peroxide, while the latter is disengaged in the form of gas, still he would perhaps conclude that nothing more was required than the addition of nitric acid, in order to effect the transition of the salt from the state of protosulphate to that of persulphate. A further acquaintance with the principles of Chemistry is therefore necessary, in order to understand that iron, in the state of peroxide, requires more sulphuric acid, than it does in the state of protoxide, to form a neutral and definite compound; in fact, that as the peroxide of iron contains one-half more oxygen than the protoxide, so the persulphate of iron contains one-half more sulphuric acid than the protosulphate. By means of the knowledge which Chemistry affords of the composition of these salts, and the laws by which their constitution is governed, we are enabled to determine theoretically what is the proper proportion in which to add the several ingredients employed in the process.

The persulphate of iron is the salt from which we usually prepare the hydrated peroxide of iron, now frequently employed as an antidote against the poisonous effects of arsenic; and I have selected this case as affording a good illustration of the kind of practical details which the operator requires to be acquainted with. Thus on adding the nitric acid to the acidulous solution of the proto-sulphate of iron, the liquor becomes nearly black, and so long as this dark colour continues, it may be inferred that the required change in the salt has not been completed. It sometimes happens, if the solution has not been repeatedly boiled during the addition of the nitric acid, that it is necessary to continue the boiling for some time afterwards, until at length a sudden evolution of red vapours takes place, which is accompanied with an immediate change from the previous dark colour of the liquor to a light yellowish red. This indicates the completion of the process. The precipitate now obtained, on adding an alkali, indicates the peroxidized state of the iron; and it is the oxide thus obtained, when in a state of purity, and recently precipitated, that forms so valuable an agent in preventing the deleterious effects of arsenic.

Every Pharmaceutist ought to be prepared to supply this remedy with the least possible delay; and, as it has been found that its efficacy is much greater when recently prepared than

when it has been kept for any length of time, even although kept in the moist state, under water, it is desirable that it should be precipitated from the persulphate on each occasion of using it. But then every Pharmaceutist should be acquainted with the method of precipitating it; and this part of the process is by no means so unimportant as some may imagine. If we gradually add solution of ammonia to the persulphate, we obtain not a pure oxide, but an oxide containing a large quantity of basic sulphate. The best method of proceeding is, not to add the ammonia to the persulphate, but the persulphate to the ammonia, and to do this quickly.

There are many cases in which variations of this kind in the manipulation occasion material differences in the nature of the products. We have a striking instance of this nature in the admixture of hydrochloric acid and sulphuret of potassium. These are the substances employed in obtaining our precipitated sulphur. On adding hydrochloric acid to solution of sulphuret of potassium, sulphuretted hydrogen is evolved, and sulphur is precipitated in fine powder. If, now, instead of adding the hydrochloric acid to the sulphuret of potassium, we reverse the process, and add the sulphuret of potassium in a very small stream to the hydrochloric acid, taking care to have the latter always in excess, we obtain a very different result; there is now no disengagement of sulphuretted hydrogen, and no precipitation of sulphur. Instead of a powder being thrown down, we now have a dense fluid, the bisulphuret of hydrogen, which remains at the bottom of the vessel. It is probable that this substance is always formed to a certain extent, in precipitating sulphur by means of an acid from an alkaline sulphuret; and its presence in minute quantity is thought by some Chemists to be the cause of the white colour of precipitated sulphur. It is known that there is a great difference in the colour of precipitated sulphur depending on the method of manipulation which is pursued, and this may perhaps arise from the greater or less quantity of bisulphuret of hydrogen formed during the process.

Now, gentlemen, my principal object this evening has been to impress upon your minds the great importance of studying systematically the different branches of knowledge which are comprised in the qualifications of the accomplished Pharmaceutist.

The occupations of the Pharmaceutical Chemist are in every way adapted for the attainment of a high degree of proficiency in the sciences connected with his art. Chemistry, Materia Medica, and Pharmacy are not book-sciences—they cannot be learnt in the library chair—the student must put on his working garb and enter the laboratory and drug-store, if he hope to make any great progress in the acquirement of this knowledge. There

can be no better foundation laid than in the occupation of the Druggist's apprentice. The lighting of the furnace fire, the handling of the measure-glass and scales, and the working of the pestle, are apt illustrations of the practical nature of the knowledge required in the Chemist as well as in the Pharmaceutist.

To the Students and Associates who attend here, I would urge the consideration of the advantages which, in many respects, they possess, and especially as compared with those of the medical student. You are called upon to qualify yourselves in four branches of science; namely, Chemistry, Botany, Materia Medica, and Pharmacy. The same qualifications are required in the medical student; but in addition to these, *he* has to study Therapeutics, Physiology, Pathology, Anatomy, Surgery, and the Practice of Physic—subjects, a competent knowledge of which would, to say the least of it, indicate a life spent in laborious research and diligent study. Think you, that there is allotted to you, too contracted, too insignificant, a field of investigation? Say rather, that an opportunity is afforded to you, which there scarcely is to the medical student, of not only studying, but of becoming proficient in the subjects of your study—of not only gaining such a knowledge as the exercise of your profession strictly requires, but of raising yourselves to eminence and distinction in that comparatively small, yet really wide and comprehensive field of science and of labour in which you are engaged.

There is no feature in this institution that so strongly commends itself to general approbation, as the provision which is made for the scientific and professional education of the members of our body. In comparison with this, every other object which has been contemplated in the establishment of the Society, either sinks into insignificance, or is merged in the more comprehensive influence of education. Mere political considerations and motives of benevolence, however laudable they may be, as evincing the interest felt by a body of men in the welfare of their brethren, are nevertheless, liable to involve a clashing of interests, and to call forth questions of policy; but the organization of means for communicating to all those who are associated with us, that knowledge which is essential to the due discharge of their important professional duties, while it affords direct and immediate benefits which are abundantly obvious, at the same time lays the foundation for those remote and indirect fruits, which will prove the soundness of our policy, by fulfilling the dictates of practical benevolence.

PHARMACEUTICAL MEETING,

JANUARY 11th, 1843.

MR. MORSON IN THE CHAIR.

ON THE PREPARATION, CHARACTERS, AND COMPOSITION OF THE NITRATE, PHOSPHATE, TARTRATES AND HYDRIODATE OF MORPHIA.

BY A. T. THOMSON, M.D., F.L.S.

Before proceeding to describe these salts, it is proper to state that they were made in my laboratory, at University College, by my friend and late assistant, Dr. Gilbert, whose accuracy deserves the utmost confidence, and who was fully qualified for carrying on the inquiries which I was anxious to make respecting them. I may also state that I am, at present, engaged in experimenting with them upon quadrupeds; and, in ascertaining the influence of each of them on the human system, in order to determine their comparative value, with the salts of Morphia now in use; namely, the *hydrochlorate*, the *acetate*, the *sulphate*, and the *bimeconate*.

1. Nitrate of Morphia.—This salt is made by adding morphia to very dilute nitric acid, until the resulting solution ceases to redden blue litmus paper. A slight excess of the alkaloid, sufficient to render the solution turbid, should be employed; as then the formation of an acidulous salt, and the consequent red solution, the result of decomposition, are avoided—a very slight excess of acid being sufficient to decompose the salt. The solution should be concentrated by evaporation, filtered and left to crystallize. If enough of the morphia has been used, the mother liquid is almost colourless.

The crystals of nitrate of morphia are not easily obtained perfectly free from colour; they have generally a very slight pinkish tinge; their solution restores the colour to reddened litmus paper, but does not affect the syrup of violets. Ammonia precipitates morphia, and the presence of nitric acid is demonstrated by heating a solution of the salt with hydrochloric acid and gold leaf, the latter being dissolved.

Ten grains of the nitrate being heated for five hours over a water-bath, lost 0.45 grains=4.5 per cent (*water of crystallization*). By treatment with ammonia, ten grains of the salt yielded 0.82 grains of precipitate=8.2 per cent. By submitting crystallized morphia to a temperature approaching to, but not exceeding, that of boiling water, it did not, in two experiments instituted for the purpose of ascertaining the fact, lose weight, and consequently it retained the two equivalents of water of crystallization,

which the salt is known to contain. Whether or not the precipitated morphia obtained by adding ammonia to a warm solution of one of its salts, and stirring the mixture, and which is said to be in minute crystals, contains two equivalents of water of crystallization is, so far as I can find, nowhere distinctly stated in books. It is, however, stated, that the precipitate yielded by this method, has the crystalline form, and as it is also stated that morphia in crystals contains two equivalents of water of crystallization, I have presumed that the precipitate, mentioned above, as derived from the nitrate, and which was dried under a temperature of 212° is a compound of one equivalent of morphia+two equivalents of water=302.23.

If the composition of the salt be one equivalent of hydrated morphia (one equivalent of morphia+one equivalent of water, the condition in which morphia is supposed always to enter into salts)+one equivalent of nitric acid, and two equivalents of water of crystallization=374.38, the per centage of the precipitate (one equivalent of morphia+two equivalents of water), which the sale should give is 82.89, and the two equivalents of water of crystallization is equal to 4.87 per cent, neither of these sums differ greatly from the quantities found.

	By Experiment.	By Calculation
Precipitated Morphia	82.09	82.89
Water of Crystallization . . .	4.50	4.87

2. Phosphate of Morphia is prepared by precisely the same process as the nitrate, substituting dilute phosphoric acid for nitric acid. The crystals are beautifully white, light, and silky looking; their solution has an alkaline re-action, and deposits morphia when ammonia is added. Ten grains of this salt lost 1.3 grains by being heated for two hours over a water-bath; and another quantity of ten grains lost 1.2 grains by exposure to the same temperature for five hours. By treatment with ammonia seventy-four per cent. of precipitate was obtained, and the mother liquid still contained morphia. Supposing, therefore, that phosphoric acid contains five equivalents of oxygen, that it requires three equivalents of base, and that either all of these three may be fixed bases, or one or more of them may be water acting as a base (as shown by Mr. Graham), the phosphate of morphia will contain one, two, or three equivalents of morphia.

This salt was formed by adding morphia to phosphoric acid until the liquid ceased to give an acid reaction: it is, therefore, not an acidulous salt, and should, by analogy, contain two or more equivalents of morphia (the phosphates of potassa and of soda having only one equivalent of alkaline base, and two of basic water, are acidulous salts, and react as such with litmus paper). It is not very probable that the salt contains three

equivalents of morphia, as a very slight addition of acid gives to its solution an acid reaction. If the salt contains one equivalent of morphia, the per centage of precipitate, which should be yielded by treatment with ammonia is, 69.6, if two equivalents it is 80.0, and if three, 84.0; that obtained, however, was 74, which is therefore incorrect, and the experiment cannot be depended upon. Taking the salt to be a neutral one, that is to say, to be composed of two equivalents of morphia, with its combined water, and one equivalent of water as bases, and one equivalent of phosphoric acid ($P_2 O_5$), then the number of equivalents of water of crystallization (as indicated by the loss of weight by heating the salt over a water-bath) is ten, and the formula of the salt is two ($\overline{M}$, H O), H O, $P_2 O_5$+10 Aq.=767.86. This gives 11.8 per cent. of water of crystallization: the loss by heating was, as stated in the above first experiment, thirteen, and in the second twelve, per cent.

3. Acid-Tartrate of Morphia.—This salt is prepared by dissolving morphia in a solution of tartaric acid, taking care that the latter is sufficiently in excess, concentrating by evaporation, and setting aside to crystallize. The size and the appearance of the crystals are much affected by the degree of purity, and of concentration of the solution:—the whiter the salt, the more difficult is it to obtain it in large well-formed crystals. The solution of this salt reddens litmus, and gives a white precipitate with ammonia, which is reddened by nitric acid;—the crystals are decomposed by a solution of iodic acid, setting iodine free, which yields iodide of amidine, when tested by cold mucilage of starch.

Two quantities of ten grains each were heated in a watch-glass over a water-bath for an hour, but neither lost weight; a third quantity of ten grains was exposed to the same temperature for five hours, and only lost half a per cent., which was probably only hygroscopic water.

Two quantities of ten grains each were heated with ammonia, and the precipitates collected and weighed; the first experiment gave sixty-four, and the second sixty-five per cent. of hydrated morphia.

Supposing the salt, therefore, to be a bitartrate, with two equivalents of water of crystallization, that is to say, one equivalent of acid as now received, and two equivalents on the old theory of the composition of the acid, with one equivalent of hydrated morphia ($\overline{M}$, HO), and one equivalent of water as bases, and two equivalents of water of crystallization, the per centage should be 67 of hydrated morphia, thus—

	($\overline{M}$+2HO) per cent.
1st Experiment gave	64
2d Experiment gave	65
Calculation gives ($\overline{M}$ HO,+2T+2Aq.=453.19)	67

4. Neutral Tartrate of Morphia is formed by saturating a solution of tartaric acid with morphia, and concentrating the liquid; crystals are deposited, which are not obtained either very white or of a good form. They are very soluble in water, and adhere together in masses, which, when dried, form a cake: this cake, although of a brown colour, yet yields a white powder. The solution of this tartrate restores the colour to reddened litmus paper:—ammonia precipitates morphia.

Ten grains of this salt, dried at a temperature rather higher than the ordinary one, were exposed to the heat of a water-bath for five hours, and lost 0.35 grains, which are equal to 3.5 per cent. If the salt be a neutral tartrate, and we suppose the loss by heating to represent the water of crystallization, the number of equivalents of that water is 3, and the formula of the salt will be $(2M\,HO)+\bar{T}+3\,Aq.=699.94$. According to this formula, the per centage of water of crystallization is 3.6.

Experiment gave . . . . 3.5 per cent. loss by heating
Theory of 3 equiv. of water of crystallization gives . 3.6

This variation of 0.1 per cent. would result from an error in the experiment amounting only to one hundredth of a grain, whereas one-tenth of a grain was the smallest weight employed. The quantity of morphia was not experimentally determined.

5. Hydriodate of Morphia is readily made by mixing strong solutions of iodide of potassium and of hydrochlorate of morphia, and stirring the mixture—the hydriodate of morphia falls down, and must be collected on a filter, washed with a *small quantity of cold water*, pressed between folds of bibulous paper, redissolved in hot water, and the solution allowed to crystallize; or it may be prepared by mixing weaker solutions (in which case no precipitate falls) evaporating the mixture, and setting it aside that crystals may form; these crystals must be washed with a little cold water, pressed between folds of paper, and recrystallized. The salts should be employed in the proportion of two parts hydrochlorate of morphia, and one part of the iodide of potassium, or rather more of the latter salt may be used, as if the hydrochlorate be in excess, crystals of it will be mixed with those of the hydriodate.

The crystals of the hydriodate are white silky prisms. The solution of this salt restores the blue colour to slightly reddened litmus, precipitates morphia when ammonia is added, and indicates the presence of iodine by chlorine and mucilage of starch.

Ten grains of the salt heated for two hours over a water-bath, lost 0.35 grains, and another quantity of ten grains, heated in the same manner for five hours, lost 0.45 grains, the first being equal to 3.5 per cent., and the second to 4.5 per cent. The quantity of morphia obtained by precipitation fell short of that indicated

by theory. If we consider the salt to be composed of one equivalent of hydriodic acid, and one equivalent of morphia, with 4.15 per cent (two equivalents) of water of crystallization, its formula will be $\bar{M}$ H I + 2 Aq. = 447.55.

REMARKS ON THE EXPERIMENTS, BY DR. GILBERT.

The methods employed for the determination of the composition of the above salts, it must be admitted, are somewhat imperfect; and the results, even when they agree pretty nearly with theory, can only be considered as approximations to the truth; as the only certain method is to submit the salts to ultimate analysis in the combustion tube.

The quantity of morphia was in all cases only determined by precipitating it from a warm solution of ten grains of the respective salts, by means of ammonia, stirring the mixture, and gently heating it on the sand-bath, to expel any excess of ammonia which might be added. The supernatant fluid and washings from the precipitate were evaporated to about ʒss; more ammonia was then added, and the supernatant fluid drawn off by means of a pipette, and again treated with ammonia. The liquids at the end of the process had, however, always a bitter taste, and contained morphia, owing to the solubility of that salt in the salts of ammonia—so that each experiment always yielded less morphia than the salt actually contained. I should think that boiling the solutions of the salts with an excess of magnesia, and afterwards taking up the morphia (from the whole evaporated to dryness over a water-bath) by means of boiling alcohol, and leaving the alcoholic solution to spontaneous evaporation, might yield results somewhat more accurate than those obtained by the former process. The precipitates were collected on filters which had been dried on a water-bath for half-an-hour, and then weighed—about four minutes being always allowed to elapse between taking the filter from the bath and determining the weight—so as to insure as nearly as possible an uniform condition with respect to moisture. The precipitate, after being washed on the filter, was dried under 212°, and weighed with the filter, observing the precautions already mentioned respecting the filter: the weight of the filter being deducted from the gross weight, the weight of the precipitate was known. The precipitate was, in the case of each salt, supposed to be composed of one equivalent morphia + two equivalents water ($\bar{M}$, two Aq.) for reasons stated when treating of the nitrate of morphia.

I did not employ smaller weights than one-tenth of a grain, and as ten grains of substance were operated upon in each experiment, every tenth of a grain of actual weight affected the result to the amount of one per cent, this together with the fact

of the solubility of the morphia in the salts of ammonia, sufficiently show, that a deficiency in the quantity found by such experiments, even to the amount of several per cent. might easily occur.

The quantity of water of crystallization which the several salts contained, was supposed to be represented by the loss of weight sustained when they were heated over boiling water for some hours. It is true, that *most* salts do lose their *water of crystallization* at that temperature, if not at a lower one; but since some do not lose it at that temperature, I would not in the absence of further experiments (which I had intended, but which I had neither time nor convenience to perform) assert the perfect correctness of the above conclusion. The acidulous tartrate, although it lost nothing by heating as above described, was assumed to contain water of crystallization, because such a view reconciled the quantity of precipitate as obtained by experiment with that required by the formula.

In all the calculations it has been assumed that each equivalent of morphia was united to one equivalent of *combined water*, which is not separable by heating the salt at the boiling point of water.

ON THE PREPARATION OF OXIDE OF ZINC.

BY MR. MIDGLEY.

Zinc is an abundant metal, and found in all the mining countries of Europe, Asia, and America; it frequently accompanies sulphuret of lead (galena), as sulphuret of zinc (black jack); it also occurs as calamine, oxide of zinc, &c., of late years it has been rendered malleable, rolled into sheets, and now rivals copper and tin for many purposes to which they were applied. Zinc was first manufactured in England, at Bristol, and an account of these works may be found in Nicholson's Dictionary, 4to edit., 1795. The symbol of zinc is Zn, specific gravity 7.00, it fuses at 773° Fahr. Volatile *per se* in close vessels, inflames in open vessels, when heated to a red heat, by combining with the oxygen of the atmosphere, and forms white flocculent particles, which were anciently called *philosophers' wool.*

The difficulty of collecting these particles in quantity, induced the adoption of the process of dissolving the zinc in acids, and precipitating and calcining; but I believe an oxide so formed, will not answer the purposes in medicine of that made by the direct combustion of zinc in a current of air, and that it is also much more expensive.

Many years ago, I had a demand for flowers or oxide of zinc, for medical purposes, and also contemplated its use as the basis

of paint; after various trials in crucibles of different descriptions I adopted a muffle made in parts, and luted together after being placed in the furnace. The muffle consisted of a large tile or bottom piece turned up at the edges, about sixteen inches long, and ten or eleven wide, to receive the roof or upper part formed by two slanting sides, having a flue at the top perforated with holes underneath, and an opening above, whereby the current of air may pass off, thus inducing a current of air through the muffle, during the combustion of the zinc.

When the muffle is placed and heated red-hot, the door being removed, from half-a-pound to three-quarters of a pound of granulated zinc is introduced, which shortly inflames, forming a pulverulent white oxide, which should be gently raised by the point of an iron rod, to expose the burning zinc to the current; these flakes may be removed when perfectly formed, till the whole is oxidized; the muffle should be cleared of one parcel before another is begun, in this way each operation may be finished in half an hour, and the product is a beautiful white oxide, smooth, soft, and light; it however requires washing, as it generally happens that a minute portion of metal adheres to the oxide.

If it is wanted to save the portion of oxide which would pass off by the current of air, the chimney of the muffle should be continued through the top of the furnace, and pass through a cylinder or tub, in which a little water is placed, and by connecting this tub with the chimney of the furnace a draught is secured, and the greatest part of the oxide will be obtained. The oxide of zinc is not volatile, only passes off by its levity in the current of air. These flues should be occasionally cleaned to keep up the draught, as on this the success of the operation depends. Oxide of zinc thus prepared, consists of a pure oxide and contains no foreign matter; while as all precipitates contain a minute portion of the salts used in the precipitation, however well washed, such oxide is less perfect. As a pigment, zinc being dearer than lead, to prepare a white oxide or carbonate would be too expensive for ordinary use, and it would be inferior in body. Some years ago, large quantities of native oxide of zinc were found in a cave at Ribbledale; an attempt was then made to use it as a paint by a party at Liverpool, but it was found to be defective in body, and resembled more white oil than white paint.

ON THE OXIDES OF ZINC OF COMMERCE,

WITH SOME REMARKS ON THE CONSTITUTION OF BASIC CARBONATE OF ZINC.

BY MR. THEOPHILUS REDWOOD.

Three processes have been given in our Pharmacopœias for the preparation of oxide of zinc. The London Pharmacopœia

of 1809, directs metallic zinc to be calcined in a crucible at a white heat, and the oxide formed to be collected and purified by elutriation. This was a troublesome process, and much of the oxide was generally lost, being carried away by the current of hot air.

In the Pharmacopœia of 1824, oxide of zinc is ordered to be precipitated from a solution of the sulphate, by means of ammonia. The following is the formula for this process :—

Take of Sulphate of Zinc 1 pound.
Solution of Ammonia 1 pint, or a sufficient quantity.
Distilled Water 1 pint.

Dissolve the sulphate of zinc in the distilled water, and add as much of the solution of ammonia as will suffice for the complete separation of the oxide of zinc. Having poured off the clear liquor, wash the powder repeatedly with distilled water, and dry it by the aid of a sand-bath." Mr. Richard Phillips, in his translation of the Pharmacopœia of 1824, says, with reference to this process, that " the quantity of water directed for the solution of the sulphate of zinc is too small for that purpose by one-half, unless it be boiling, which would preclude the possibility of using ammonia as a precipitant." Mr. Phillips recommended the use of carbonate of potash, instead of solution of ammonia, as the precipitant; " by which means," he says, "I have found that oxide, or rather carbonated oxide of zinc, containing about 12 per cent. of carbonic acid, may be advantageously prepared." He further observes, that this product " would probably be less powerful, but the use of carbonate of potash is much more economical than that of ammonia, and it is unattended with the inconvenience of re-dissolving the precipitate, if it be added in excess, an effect which is readily produced by ammonia."

The suggestion of the use of an alkaline carbonate for precipitating a carbonated oxide of zinc, has been generally adopted by manufacturers; and in the Pharmacopœia of 1836, it has, with some modifications, been sanctioned by the college. The Pharmacopœia now orders sesquicarbonate of ammonia to be added to a weak solution of sulphate of zinc, and the precipitate, after being washed with water, *to be burnt for two hours in a strong fire.* By this means a pure oxide of zinc is obtained, the carbonic acid of the precipitated carbonate being driven off by the heat, in the latter part of the process.

It appears however, that proper attention is not always paid to the instructions of the college, in reference to this preparation. Dr. Pereira says, in his Elements of Materia Medica, " the substance met with in the shops under the name of Oxide of Zinc, is in reality a carbonate of this metal, and therefore effervesces on the addition of an acid."

My attention was first directed to this subject by the above remark of Dr. Pereira's, which, on investigation I found, to a certain extent, correct. There are, in fact, two substances met with in the shops under the name of oxide of zinc. One is prepared according to the process of the Pharmacopœia of 1824; the other, according to the process suggested by Mr. Phillips as an improvement upon that. The latter contains carbonic acid; the former contains none. Neither of these preparations however correspond with the oxide of zinc of the present Pharmacopœia, and, indeed, they differ from it materially both in composition and strength.

The process of the Pharmacopœia of 1824, affords, as is well known, not a pure oxide, but a mixture of hydrated oxide and sub-sulphate of zinc; the strong basic properties of the oxide of zinc enabling it to retain a portion of the acid after the addition of a caustic alkali.

In the process recommended in 1824 by Mr. Phillips, a double decomposition takes place between the sulphate of zinc and the carbonate of potash, or other alkaline carbonate, and the sum of the affinities, in this case, seems sufficient to determine the complete separation of the sulphuric acid from the zinc; but a portion only of the carbonic acid remains combined with the oxide, forming a basic carbonate of zinc.

Our present Pharmacopœia directs this basic carbonate to be calcined, so as to drive off the carbonic acid and combined water. The oxide of zinc obtained by this process, will be perfectly pure, provided the sulphate of zinc employed be free from impurities. It is represented by the symbol Zn O, its equivalent number, according to Berzelius, being 40.32 on the hydrogen scale. This oxide is the same as that obtained by burning metallic zinc in the manner directed by the college in 1809; and as the manufacturer is allowed to deviate from the processes of the Pharmacopœia, if the products be identical, either of these two methods may be resorted to for the preparation of oxide of zinc.

The products of the other processes to which I have alluded, are, however, inadmissible as substitutes for the pure oxide of the Pharmacopœia; and as the name *oxide of zinc* has been applied, without distinction, to each of these; as the Pharmaceutical Chemist has for several years been accustomed to the beautifully white light powder, obtained by precipitation alone, without calcination; and as this article is still supplied almost exclusively by the manufacturer, I thought it desirable that the exact composition of these products should be pointed out, in order to show the material difference which exists between the substances generally employed in medicine, and that which is now ordered by the college.

I obtained specimens of the so-called oxide of zinc from several sources, for the purpose of examination. The first specimen examined was such as is now, I believe, generally met with in the shops. It presented the appearance of a perfectly white powder, and effervesced strongly on the addition of an acid. This specimen was found to contain,

Oxide of zinc,	67 parts.
Carbonic acid,	18 "
Water	15 "
	100

This is exactly the composition of the precipitated carbonate of zinc, formed according to the first part of the process of the Pharmacopœia; that is, omitting the calcination.

These proportions give,

2 Zn O	= 80.64	or	66.75
C O_2	= 22.15	"	18.33
2 H O	= 18.03	"	14.92
	120.82		100.

and the following as the formula:

$$Zn\,O, C\,O_2 + Zn\,O + 2\,H\,O.$$

This, however, does not accord with any statement that I have met with of the constitution of basic carbonate of zinc. Berzelius represents this carbonate as consisting of two atoms of carbonate of zinc, and three atoms of hydrate of zinc. Dr. Kane says, when solutions of sulphate of zinc and carbonate of soda are mixed together, a *basic carbonate of zinc* is formed, consisting of 2 (Zn O, C O_2) + 3 (Zn O, H O), if the solutions were warm, but of (Zn O, C O_2) + 2 (Zn O, H O), if cold." Professor Graham also makes the same statement on the authority of Mitscherlich.

Thus, according to this statement, a smaller proportion of carbonic acid is retained in combination with the zinc, when the decomposition is effected with cold than with hot solutions. My observations have brought me to a conclusion the reverse of this, and I am disposed to consider the formula I have given above, as correctly representing the basic carbonate formed from cold solutions.

The carbonate of zinc, obtained by precipitation from hot solutions, I have found to contain,

Oxide of zinc	72 parts.
Carbonic acid	12 "
Water.....	16 "
	100

Or,

7 Zn O	= 282.24	or	72.32
2 C O_2	= 44.32	—	11.36
7 H O	= 63.70	—	16.32
	390.26		100.00

The formula for which would be

$$2\ Zn\ O, C\ O_2 + 5\ Zn\ O + 7\ H\ O.$$

It will be observed, that the quantity of carbonic acid in this carbonate corresponds exactly with that indicated by Mr. Phillips in the quotation already given.

I have taken much pains in my experiments to determine with accuracy the proportion of carbonic acid, using for that purpose the very convenient and simple apparatus described by Mr. Parnell in his Elements of Chemical Analysis.

The next specimen of commercial oxide of zinc which I examined, presented a similar appearance to the former, being a very white light powder. It afforded no effervescence on the addition of acids, but yielded a dense precipitate on adding chloride of barium to its solution in hydrochloric acid.

It was composed of,

Oxide of zinc. ..	64 parts.
Sulphuric acid	13 "
Water.....	23 "
	100

Or,

5 Zn O	= 201.60	or	64.23
S O_3	= 40.16	"	12.79
8 H O	= 72.11	"	22.98
	313.87		100.

and may be represented by the formula,

$$(3\ Zn\ O, S\ O_3, 4\ H\ O) + (2\ Zn\ O, 4\ H\ O).$$

This is the oxide of zinc of the Pharmacopœia of 1824, formed by precipitating from solution of sulphate of zinc with solution of ammonia. It is a mixture of basic sulphate of zinc and hydrate of zinc. The water and sulphuric acid may be driven off by calcining it at a strong heat, and it then leaves 64 per cent. of pure oxide.

It is worthy of remark, that this latter specimen, which, from the fact of its not effervescing with acids, has been supposed by some persons to be pure oxide of zinc, contains less oxide than the basic carbonate previously alluded to.

All the specimens I have obtained accord with one or other of the foregoing in their composition, and it may therefore be considered that the oxides of zinc of commerce are either *basic carbonates* or *basic sulphates*, containing only from 64 to 67 per cent. of oxide.

I have heard it sometimes remarked by medical men, that the oxide of zinc prepared in the old way by calcination, was much more efficacious as an external application than that obtained by precipitation; and, considering the difference of constitution in the two, this may be readily supposed to be the case. It is therefore the more important that the instructions of the college should be so far attended to, as that an article identical in composition with that resulting from their process may be uniformly obtained. It is necessary, however, that both the dispenser and prescriber should be prepared for the difference in appearance which the oxide of zinc of the Pharmacopœia presents, as compared with the beautifully white powder obtained by precipitation alone. Mr. Phillips, in his translation of the Pharmacopœia, describes the oxide prepared according to the process of the college, as possessing a yellowish white colour. I am not certain whether this colour arises from impurities or not. Oxide of zinc is generally described as being perfectly white when cold, but assuming a beautiful canary colour while exposed to a strong heat. Soubeiran however, observes, that if too strong a heat be applied, the oxide becomes permanently coloured; and this probably depends on the state of aggregation of the particles, for according to Berzelius, it is always yellow when crystallized. Professor Graham, however, informs me that he has a specimen of crystallized oxide of zinc which is colourless and transparent.

The sulphate of zinc of commerce, even that which is called purified, generally contains a portion of iron, and this, unless previously removed, would cause discolouration of the oxide.

In the Pharmacopœia Borussica, the sulphate of zinc of commerce is directed to be calcined with one-tenth of its weight of nitrate of potash, to free it from iron; the iron being by this means converted into sesquioxide, which may be afterwards removed by solution and filtration.

The manufacturers in this country remove the oxide of iron, by adding to the solution a small quantity of the precipitant subsequently employed for throwing down the oxide of zinc.

Copper, lead, and cadmium, which are frequently present in the common sulphate of zinc, may be removed by leaving the solution for some time in contact with metallic zinc.

If the sulphate of zinc be thus previously purified, the process of the Pharmacopœia appears to be an unexceptionable method of preparing pure oxide of zinc, and is certainly a great improvement upon that which preceded it.

Carbonate of ammonia is, perhaps, preferable to carbonate of soda or of potash, as the precipitant in this process, for although carbonate of ammonia is subject to the same objection which was urged by Mr. Phillips in 1824, against solution of ammonia, namely, that it dissolves the oxide of zinc if added in excess;

yet this inconvenience may be avoided by carefully regulating the proportions, and the volatile carbonate possesses an advantage in other respects, which has no doubt led to its adoption by the college. It has been observed by Mitscherlich and others, that when an alkaline carbonate is added to solution of sulphate of zinc, a portion of the alkali combines with the oxide of zinc, forming a double salt. If the alkali used be carbonate of ammonia, this is not material, as the combined portion is subsequently driven off during the calcination; if, however, carbonate of soda or potash be employed, these remain mixed with the oxide, and would affect the purity of the product.

Mr. Ince observed, that the society was under an obligation to the authors of the above papers for bringing the subject forward, which he considered more important than was generally imagined. In illustration of the consequences of substituting the carbonate for the oxide of zinc, he adverted to the following prescriptions in which the result would be materially affected:

℞ Unguenti Zinci,
Cerati. Plumbi Acetatis, āā ℥ss.
M. fiat Unguentum.

℞ Zinci Oxidi, ℥j.
Liquoris Calcis, ℥iij.
M. fiat Lotio.

℞ Extracti Gentianæ, ℥j.
Oxidi Zinci, ℥ij.
M. et divide in Pilulas xl.

Mr. Ince observed, that any ointment prepared with oxide of zinc was different in its character from one in which the carbonate had been substituted, and considered the difference analogous to that between chalk and lime. He remarked, that the only objection to the original method of preparing the *flowers* of zinc, was the almost utter impossibility of procuring it free from particles of metallic zinc. It possessed the advantage of being beautifully white and quite anhydrous. The process of preparing it by means of caustic ammonia, was subject to the inconvenience of the formation of a soluble double salt, which materially affected the amount of the product, which was an impure hydrate. Mr. Ince concluded by observing, that the formula of the last London Pharmacopœia was unquestionably an improvement on all its predecessors, but that the calcination ought to be effectually and carefully performed.

The Chairman inquired of Mr. Midgley, whether he had, in his experience, found any difficulty in preparing the *flowers of zinc* free from metallic particles?

Mr. Midgley replied, that these particles were easily separated by diffusion in water, the metal, from its gravity, sinking to the bottom, when the suspended oxide might be poured off. He

had manufactured the article extensively for a medical practitioner, who had acquired great reputation from the successful employment of it as an external application. He had also contemplated its use as a pigment, but was disappointed in the result.

Mr. Squire stated, that he had used oxide of zinc for painting his laboratory, but found that it changed colour sooner than white lead.

Mr. Redwood stated, that the presence of metallic zinc was not the only objection to the process by combustion, as he had always found that a portion of suboxide was formed, being a grey powder, similiar to the oxide which is formed by the action of the air on zinc pipes. The formation of this suboxide in the crucible, arose, without doubt, from the combustion being incomplete.

Mr. Scanlan, in confirmation of this remark, said, that he had endeavoured to prepare the oxide of zinc, by passing a current of hot air over the melted metal, and that the product consisted entirely of the grey or suboxide.

Dr. Clendinning informed the meeting, that he considered the oxide of zinc a valuable remedy, both internally and externally, while the carbonate possessed very little efficacy. He had frequently been disappointed in the result when prescribing the oxide, and had recently almost discontinued the use of it in consequence, but he was glad that through the medium of the Pharmaceutical Society some explanation was given, which he trusted would lead to an improved method of preparing it.

ON SPIRITUS ROSMARINI AND LINIMENTUM SAPONIS.

BY MR. R. J. FISHER.

I BEG to call the attention of the Society to two preparations of the London Pharmacopœia, namely, the spiritus rosmarini and the linimentum saponis. This subject has been treated of by Mr. Shum, in the last number of the PHARMACEUTICAL JOURNAL (page 457); but I had not seen his paper at the time the following remarks were written.

The preparation of the spiritus rosmarini has been subjected to many alterations in the successive editions of the London Pharmacopœia, and I think it will not be difficult to prove, that these alterations have not always been improvements.

The following statement shows the variations in the formula:

In the year 1809, two pounds of fresh tops were ordered to be distilled with one gallon of proof spirit.

In 1815, two pounds of fresh tops with one gallon of rectified spirit.

In 1824, one ounce of oil of rosemary with one gallon of rectified spirit.

In 1836, two drachms of oil of rosemary with one gallon of rectified spirit.

This last, by the way, is the imperial gallon measure, and consequently consists of eight pints of twenty ounces each, being an addition of one-fourth.

I have no remarks to make upon the formula of 1809; as it is objectionable from being made with proof spirit.

With regard to that of 1815, I can only say, that it was in every way efficient and elegant, certainly the best in the above list, nor am I prepared to name any improvement.

But in the Pharmacopœia Londinensis for 1824, we meet with a very important alteration, namely, the substitution of one ounce of oil of rosemary for the two pounds of fresh tops heretofore directed.

The framers of this prescription could not, of course, have intended that any oil should be used, but that which was genuine; but what a vast increase of strength, and likewise of expense, was imposed by this change!

One hundred weight of fresh rosemary tops will yield on distillation *only four ounces* of oil—and this I believe to be the average quantity; consequently we have in every gallon thus prepared the strength of twenty-eight pounds of rosemary tops, whereas formerly two pounds had been considered sufficient. Being anxious never to employ any but genuine articles, I was at some pains to procure the genuine English oil of rosemary, the price of which varied between fifteen shillings and twenty-four shillings per ounce, much more frequently the latter than the former—whilst the foreign oil could be procured at 4*s.* 8*d.* per lb.; but this latter could scarcely be the article intended in the Pharmacopœia, as there can be no dependence upon it, and even if it were perfectly genuine, my objection to the formula will still remain in full force.

Influenced by these considerations, previous to the publication of the last Pharmacopœia, I wrote to a physician on the subject, expressing my views, and requesting he would be good enough to communicate them to the Council—whether he did so or not I am ignorant; but on the publication of the new Pharmacopœia in 1836, the quantity of oil was reduced to one-fourth, or less—as two drachms of the oil was, and is now ordered to the gallon imperial.

The conclusion I wish to draw from the foregoing observations is, that even now we have an excess of rosemary, and that the

present formula is not an improvement upon the recipe in the Pharmacopœia Londinensis of 1815. Any one may satisfy hinself, who will take the trouble to distil one gallon from the best oil (even that at 24*s.* per ounce) and another gallon from two lbs. fresh tops, and compare them, particularly after having been kept for a short time: he will find how vastly superior in every way the latter is to the former.

I beg it may be understood that I would not for one moment consider expense—if we obtain an equivalent in the superior quality of the preparation; but I apprehend there can be no objection to the diminution of expense when the article is the better for it.

Another circumstance bearing strongly upon my view of the matter is, that if the real English oil of rosemary is to be used, I doubt whether the supply is at present equal to the demand, although if price is no object, that would soon be remedied.

Although venturing thus to criticise it, I do not advocate any deviation from the London Pharmacopœia, and consider myself in duty bound to follow its directions as far as possible; but I must express the hope that the time is not far distant, when the practical knowledge and experience of the Members of the Pharmaceutical Society shall be called upon in aid of other learned and scientific bodies in the production of a Pharmacopœia.

I now come to the second part of my subject, which is the linimentum saponis, and beg to premise, that by the authors of several useful papers which have been read at these meetings, it has been demonstrated that certain preparations, about which there had previously been some doubt, *could* be made perfect, by strict adherence to the Pharmacopœia Londinensis. In the case of the linimentum saponis, however, I am not sure that we shall arrive at the same conclusion. If it be the intention of the college that spirit of rosemary should be "rectified spirit," that is to say, fifty-four or fifty-six per cent. over proof, the soap liniment made with it will certainly partake more of the nature of a solid than a liquid: in short, it would resemble Steer's opodeldoc. But there is a very great difference in the result according to the quantity made at one time; as for example, any one preparing one gallon of linimentum saponis precisely according to the Pharmacopœia directions, would first distil one gallon of spirit of rosemary, whether from oil or herb it matters not, he would then add the Castile soap and camphor, and he would find his linimentum saponis to be just what we expect it to be, and at all events what we wish it to be, that is to say, *liquid* at all temperatures.

But this will not be the case if it is done on a large scale, say

twenty gallons; in this case it will prove, as I said before, a jelly; the same inconvenience will occur, if the oil of rosemary, ordered by the Pharmacopœia, is merely added to the rectified spirit, without any distillation at all, as is probably sometimes done. I think the explanation of these discrepancies is easy. In distilling only one gallon, whether from tops or oil, a portion of water is directed to be put into the still to prevent burning—let it be distilled as carefully as possible, some portion of water will necessarily rise in the process, and this may be proved as follows: If at the moment the gallon has run off, the head of the still is removed and a lighted paper applied, the vapour will partially ignite, showing distinctly that the whole of the spirit has not come over, and the product consequently is not *rectified*. Now, when the quantity is twenty gallons, although *some* water will be present, there will not be sufficient to produce this effect, and having made experiments upon the subject, I find one-eighth of water would solve the difficulty, and would scarcely interfere with the efficacy of the preparation. Of course, in adding the water the proper proportion of soap and camphor should be added likewise. I conceive that the addition of so small a quantity of water is better than the substitution of soft soap, which does not succeed after all.

I have sent a small quantity of linimentum saponis for the inspection of the meeting. It is prepared by distilling one gallon of rectified spirit from two pounds and a half of rosemary tops, with a little water to prevent burning, the proper proportion of white Castile soap and camphor was then added, *secundum artem*, and I have never found it differ from the present specimen.

In this case I do not exactly know what to say about the deviation from the Pharmacopœia: I am satisfied that if the spirit is fully rectified, the linimentum saponis will be gelatinous; and, in spite of our endeavours and wishes to comply with the college directions, we must, in this instance, deviate a little, and, I really think, I have indicated that course which is attended with the least possible objection.

Bond Street, December, 1842.

Mr. Herring confirmed Mr. Fisher's statement respecting the oil of rosemary, observing, that he had seldom obtained more than four or five ounces from a cwt. of the herb, and sometimes it yielded scarcely any. The oil of rosemary, imported into this country, was well known to be very impure, often containing a very small proportion if any of the genuine oil. He was anxious always to advocate an adherence to the instructions of the Pharmacopœia; but, in this instance, he considered the product much superior when made from the herb.

ON SULPHUR PRÆCIPITATUM, AND SULPHUR SUBLIMATUM.

BY EDWARD G. SCHWEITZER,
Member of the Chemical Society, Honorary Member of the Pharmaceutical Society, &c.

In a paper on Sulphur Præcipitatum, which I published in 1837, I have already drawn the attention of Pharmaceutic Chemists to this valuable preparation, particularly noticing its adulteration by sulphate of lime.

In this treatise I shall more fully enter into the subject, taking particularly into account the various methods for its preparation.

From the proportion of the impurity, it is quite evident that sulphuric acid is employed instead of hydrochloric acid for the purpose of decomposing the sulphuret of calcium. By this means a product is obtained of sulphur mixed with more than double its weight of sulphate of lime. When caustic lime and an appropriate quantity of sulphur are boiled with distilled water, a fluid is obtained of a dark yellowish brown colour, which fluid was divided into two equal parts, one of which was decomposed by hydrochloric acid, the other by sulphuric acid, either of them being added until the fluid itself became slightly acid, and began to emit hydrosulphuric acid gas.

The precipitates were properly lixiviated and dried. The dry precipitate, which was derived from the fluid decomposed by hydrochloric acid, weighed 15.5 grains, whereas the precipitate of that, which had been decomposed by sulphuric acid, weighed 38.4 grains. Both precipitates were heated in platina crucibles, the former entirely volatilized, while the latter left from the above weight 19.2 sulphate of lime.

The result of this experiment coincides with that of my investigation, referring to lac sulphuris of Chemists and Druggists, which, when heated, left exactly half its weight of sulphate of lime, therefore as the sulphate of lime contains 20.78 per cent. or two equivalents of water of crystallization, the purchased sulphur præcipitatum will contain in 100:

Sulphate of lime	50.
Water of crystallizat.	13.1
Sulphur	36.9
	100.0

The quantity of sulphate of lime may, in some instances, slightly vary, when the sulphur has been precipitated from a very diluted menstruum, or when it has been very much lixiviated, but as the sulphate of lime is little soluble in water (one part requiring 461.5 parts of water) the difference can only be small.

An excellent though rather expensive method for the prepara-

tion of lac sulphuris, consists in dissolving sulphur in caustic potassa and decomposing the diluted fluid by hydrochloric or sulphuric acid. By this process penta-sulphuret of potassium and hyposulphite of potassa are formed. It is necessary for the production of a good lac sulphuris, to avoid the decomposition of the hyposulphite of potassa from causes which will be hereafter illustrated; it is hence requisite to add gradually diluted acid (the concentrated acid is to be diluted with 10 parts of water), until hydrosulphuric acid gas begins to disengage itself and blue litmus paper becomes slightly reddened. The medium from which the sulphur is to be precipitated should be well diluted, and one part of dissolved sulphur to 30 parts of water will be found a sufficient and requisite proportion. As soon as the sulphur is precipitated it is necessary immediately to separate it from the supernatant fluid, which contains the hyposulphite salt in solution, and which by the presence of free hydrosulphuric acid becomes decomposed, and thus deteriorates the quality of the precipitate. These precautions are to be observed from whatever kind of sulphurets the sulphur may be obtained. The chemical changes produced by the above process will be more clearly illustrated by the application of the chemical formulas of Berzelius.

When diluted caustic potassa is boiled with sulphur till it is saturated, it will be found that 3 equivalents of potassa will dissolve 12 equivalents of sulphur, thus,

$3\,KO + 12\,S = 3\,K + 3\,O + 12\,S$, the solution will contain the following products:

$K + 3\,O + 2\,S = K\,O + S_2\,O_2$ forming hyposulphite of potassa.

$2\,K + 10\,S = 2\,K\,S_5$ forming pentasulphuret of potassium.

The solution will therefore contain 2 equiv. of pentasulphuret of potassium and one equiv. of hyposulphite of potassa. Supposing hydrochloric acid is added for the precipitation of the sulphur, one equivalent of the former will be sufficient to avoid the decomposition of the hyposulphite, thus:

$K\,O + S_2\,O_2 + 2\,K\,S_5 + Cl_2\,H_2 = 3\,K + 3\,O + 12\,S + 2\,Cl + 2\,H$

$K + 2\,Cl = K\,Cl_2$ chloride of potassium.

$2\,K + 3\,O + 12\,S + 2\,H$

$K + 3\,O + 2\,S = K\,O + S_2\,O_2$, forming hyposulphite of potassa.

$K + 10\,S + 2\,H$

$K + 2\,S + 2\,H = K\,S + H_2\,S$, forming bihydrosulphuret of potassium.*

Leaving 8 S as precipitate.

* This sulphuret is analogous in composition to hydrate of potassa in the oxygen series.

This theoretical result corresponds very nearly with the practical one, since from 60 to 66 per cent. are obtained from the sulphur applied for the purpose. The fluid separated from the precipitate contains (besides the chloride of potassium) hyposulphite of potassa and bihydrosulphuret of potassium and it may be interesting, in a scientific point of view, to show, that, by the addition of 2 equiv. of hydrochloric acid, the whole amount of sulphur may be obtained. This can be proved theoretically, and practically also by proper manipulation. Thus the hyposulphurous acid set free by hydrochloric acid, is decomposed into sulphur and sulphurous acid, which latter, again in contact with hydrosulphuric acid of the bihydrosulph. of potassium is changed into sulphur and water, viz:

$$K\,O + S_2\,O_2 + K\,S + S\,H_2 + 4\,Cl + 4\,H = 2\,K + 3\,O + 4\,S + 4\,Cl + 6\,H$$

$$2\,K + 4\,Cl = 2\,K\,Cl_2,$$

forming chloride of potassium.

$$3\,O + 4\,S + 6\,H$$

$$O + 2\,H = H_2\,O,$$

forming water.

$$2\,O + 4\,S + 4\,H$$

$$2\,O + 2\,S = S_2\,O_2,$$

forming hyposulphurous acid.

$$2\,S + 4\,H = 2\,H_2\,S,$$

forming 2 eq. of hydrosulphuric acid.

Again:

$$S_2\,O_2 = S + S\,O_2 = \left\{\begin{matrix} 2\,O + 2\,S \\ 4\,H + 2\,S \end{matrix}\right\} = 4\,S.$$

$$= 2\,H_2\,O$$

$$2\,H_2\,S$$

forming 2 eq. of water and 4 eq. of sulphur, which added to the above 8 eq. will give 12 eq. of lac sulphuris; but as has been before observed, these 4 eq. of sulphur would spoil the quality of the preparation, and must therefore be left in solution.

Another good method is to produce a pentasulphuret of potassium by melting 2 parts of purified carbonate of potassa and one part of sulphur. It is adviseable, in order to facilitate the operation, to dry the carbonate of potassa well before it is mixed with the sulphur: if this is not attended to a good deal of sulphur burns away by the heat, which is requisite to free the potassa from its hygroscopic water, &c., until this has been discharged the combination is retarded.

A solution of this sulphuret is similar to that obtained from the first method with the exception, that it contains sulphate instead of hyposulphite of potassa. The chemical illustration is thus:

$4\,KO + CO_2 + 16\,S = 4\,K + 12\,O + 4\,C + 16\,S$

$K + 4\,O + S = KO + SO_3$, forming sulphate of potassa.

$3\,K + 8\,O + 4\,C + 15\,S$

$8\,O + 4\,C = 4\,C\,O_2$ carbonic acid gas discharged.

$3\,K + 15\,S = 3\,K\,S_5$, forming pentasulphuret of potassium.

The pentasulphuret of potassium, decomposed by hydrochloric acid, gives as products, viz., precipitated sulphur, chloride of potassium, and bihydrosulphuret of potassium ($KS + H_2S$). This method affords about sixty per cent. of lac sulphuris. The cheaper sulphuric acid may here be applied for the precipitation of the sulphur. The following method, on account of its cheapness, is adopted by many manufacturers to obtain lac sulphuris, viz., to boil quick lime and flowers of sulphur with water, and precipitate from the solution the sulphur by hydrochloric acid. Bad materials and unskilful manipulation have unjustly lessened the value of this method, which otherwise yields very good results. To be successful in the operation, one part of quick lime is to be slackened by three parts of water, to which is to be afterwards added two parts of flowers of sulphur. This mass is to be brought into an iron vessel and kept boiling, with fifteen parts of water, for half-an-hour. It is then to be transferred into a close vessel, and when cool to be freed from the sediment which is to be lixiviated. The clear and filtered solution is to be diluted with water, until the whole amounts to thirty parts of the sulphur applied in the process. The sulphur is now to be precipitated by pure hydrochloric acid (diluted with three parts of water) with the usual precautions, and well lixiviated, and dried at a gentle temperature. By this process a pure lac sulphuris, from 55 to 57 per cent. will be obtained. When caustic lime and sulphur are boiled with water pentasulphuret of calcium, bisulphuret of calcium, and hyposulphite of lime, are formed, as shown by the following formulas:

$3\,CaO + 9\,S = 3\,Ca + 9\,S + 3\,O$ when boiled, will form—

$Ca + 2\,S + 3\,O = CaO + S_2O_2$, hyposulphite of lime.

$2\,Ca + 7\,S$

$Ca + 2\,S = CaS_2$, bisulphuret of calcium.

$Ca + 5\,S = CaS_5$, pentasulphuret of calcium.

If to this solution one eq. of hydrochloric acid were added, the two sulphurets would be changed, without the decomposition of the hyposulphite, into

$$Ca\,O + S_2\,O_2 + Ca\,S_2 + Ca\,S_5 + H_2\,Cl_2 = 3\,Ca + 3\,O + 9\,S + 2\,H + 2\,Cl$$

$$Ca + 3\,O + 2\,S = Ca\,O + S_2\,O_2,$$

hyposulphite of lime.

$$2\,Ca + 7\,S + 2\,H + 2\,Cl$$

$$Ca + 2\,Cl = Ca\,Cl_2,$$

chloride of calcium.

$$Ca + 7\,S + 2\,H$$

$$Ca + 2\,S + 2\,H = Ca\,S + H_2\,S,$$

bihydrosulphuret of calcium.

Leaving 5 S

The second and third method recommend themselves, on account of the cheapness of their materials, and the choice of either becomes a matter of mere pecuniary consideration. In the first instance, purified carbonate of potassa and ordinary sulphuric acid would be required; in the latter, caustic lime and rectified hydrochloric acid.

It is necessary to free the ordinary sulphuric acid from particles of lead, which it usually contains; for that purpose the acid is to be diluted with ten parts of water, and a current of hydrosulphuric acid gas is to be passed through it, until the fluid is saturated therewith. After a few days, the acid can be drawn off, by a glass syphon, from the precipitate. The application of ordinary hydrochloric acid is quite inadmissible, as it contains no inconsiderable quantity of arsenic. The acid, diluted with three parts of water, can be purified by a current of hydrosulphuric acid gas, but it is requisite when the acid is saturated with that gas, to place it for one day in a sand-bath, at a temperature of 140° Fahr., by which means the superadded hydrosulphuric acid will escape, which keeps in solution a considerable quantity of sulphuret of arsenic. By this precaution every trace of arsenic will be separated. The ordinary hydrochloric acid contains also chloride of iron of which impurity the lac sulphuris will partake, and on this account the rectified hydrochloric acid alone should be employed.

If the above precautions be adhered to, a uniform and pure lac sulphuris will be obtained, whichever method has been employed. The colour of it is of a whitish grey, with occasionally a very slight tinge of yellow; but if the yellow be predominant it proves that the lac sulphuris is intermixed with the sulphur from the decomposition of the hydrosulphurous acid, of which I have satisfied myself by frequent experiments. The sulphur, which is separated from this acid, is yellow, like the flowers of sulphur, which H. Rose has already noticed. There exists a slight difference in the colour of the sulphur obtained from the

melted sulphuret of potassium, which is always whitish grey, whereas the sulphur produced by the other methods has a slight tinge of the yellow, but the chemical constitution of the different sulphurets in solution will sufficiently illustrate this, since, according to theory, the solution of the sulphuret of potassium, procured by melting, is free from hydrosulphurous acid, the decomposition of which cannot be entirely avoided in the solution of the other sulphurets. Yet slight traces of hyposulphite of potassa will still be found in a solution of hepar sulphuris, which is to be ascribed to the oxidizing influence of the atmospheric air. Amongst other proofs of its existence is this: that after the precipitation of the lac sulphuris under the usual precautions, the supernatant fluid will become turbid from the decomposition of the hyposulphurous acid. Hence it is requisite to separate the precipitate from the supernatant fluid as soon as possible, and to use only so much acid as is necessary to decompose the pentasulphuret without the hyposulphite.

Lac sulphuris heated upon platina, should entirely volatilize any impurity of solid substances will remain behind, and can easily be tested. Boiling water should extract nothing from it, and it should be free from hydrosulphuric acid, the presence of which can be substantiated by mixing it with a solution of acetate of lead.

It is not uncommon to find arsenic in lac sulphuris, arising chiefly from the application of the ordinary hydrochloric acid. To ascertain its presence, the sulphur is to be digested with caustic ammonia, which, with a trace of sulphur, will dissolve the sulphuret of arsenic. After the evaporation of the ammonia, the residue is to be treated with concentrated nitric acid, and the solution, saturated with carbonate of lime, is to be evaporated and ignited: the residue again dissolved in hydrochloric acid is to be introduced into Marsh's apparatus, by which the smallest traces of arsenic can be discovered.

Pure lac sulphuris, well lixiviated and dried, will remain unchanged by atmospheric air.

In reference to its chemical constitution, it has been assumed by some Chemists, that it is a hydrate of sulphur; by others, that it differs from flowers of sulphur only in the minuteness of its particles.

The enquiries which I have instituted on the subject, confirm the opinion which I have already entertained, that it is a sulphur of minute division, containing also a small proportion of hydrosulphuric acid, perhaps a persulphuret of hydrogen.

Although every kind of sulphur that I examined, contained a small proportion of hydrosulphuric acid, still lac sulphuris yielded the most, and as this sulphur is often mixed with the

sulphur obtained from a hyposulphite salt, I have ascertained both their quantitative proportions of hydrosulphuric acid. Boiling water will only remove that portion of this acid which adheres mechanically to the sulphur, but not that which is chemically united with it, nor does a solution of acetate of lead indicate its presence, but when the sulphur is melted, the hydrosulphuric acid is discharged. For that purpose I introduced 200 grains of the dry sulphur to be experimented upon, into a small glass retort, and brought the same by connecting tubes in communication with two glass vessels, one containing a solution of chloride of copper, the other a similar solution supersaturated with ammonia. The sulphur was melted and boiled until all gaseous disengagement ceased, when a current of atmospheric air was passed through the vessels, in order to carry every particle of the emitted gas through the solutions of copper. The sulphuret of copper thus obtained was collected upon a small filter, quickly lixiviated, and oxidized by concentrated nitric acid. In this solution the sulphuric acid was precipitated by nitrate of barytes, and from the sulphate of barytes was computed the quantity of hydrosulphuric acid. Thus 100 grains of lac sulphuris gave 0.03939 grains of H_2S (hydrosulphuric acid), whereas sulphur obtained from the decomposition of pure hyposulphite of soda contained only 0.01900 grains H_2S.

The sulphur obtained from the decomposition of sulphurous acid by hydrosulphuric acid, has the same appearance as that derived from a hyposulphite salt; both acids may meet in a highly diluted state, and the precipitated sulphur may remain suspended in the water for some time, yet where the sulphur is deposited, it will be of a yellow colour. It is the same with sulphur obtained from the decomposition of hydrosulphuric acid by peroxide of iron. The only precipitated sulphur that resembles lac sulphuris, is that derived from the decomposition of an aqueous solution of hydrosulphuric acid gas.

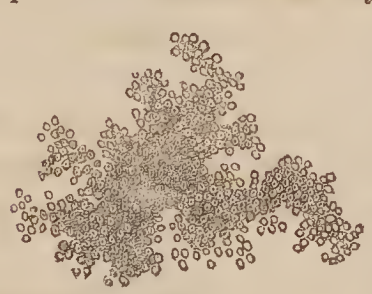


Fig. *E.*

Lac sulphuris represents, under the microscope, an aggregate of small globules, as shown in fig. E,* each globule varies, about from $\frac{1}{7000}$ to $\frac{1}{10500}$ of an inch in diameter: they appear opaque and smooth, and bear no indication of crystalline structure. The globules of sulphur obtained from hyposulphites show the same appearance, but with this difference, that they remain exposed to the atmospheric air, for a length of time in a semifluid state, whereas those of lac sulphuris, as soon as they are removed

* The figure in this plate exhibits various sulphur globules magnified to 400 linear dimensions.

from the menstruum in which they are precipitated, become directly solid. This is the cause why the sulphur of the hypo-sulphurous acid forms, freshly precipitated, an adhesive mass adhering to the sides of the vessel. The globules stick to each other, and often unite to larger ones, and enclose impurities, such as metallic substances, contained in the fluid from which they have been separated, and from which they are difficult to be freed, but which are detected as soon as the sulphur is dissipated by heat.

Sulphur globules in this semi-fluid state exhibit, under particular circumstances, interesting changes, which I found best illustrated by those of sublimated sulphur.

The flowers of sulphur (sulphur sublimatum), such as they are obtained from manufactories, consist of globules of different sizes, whose diameter varies between $\frac{1}{700}$ and $\frac{1}{2800}$ of an inch. They are opaque, and not crystalline, as generally considered, "arising from the opinion that sulphur assumes a crystalline form in its passage from a state of fusion." To ascertain the cause of this anomaly, I allowed the vapour of boiling sulphur to fall upon a glass slide at different distances from the mouth of the tube, which exhaled the sulphur vapours, and found, under the microscope, that it contained transparent globules of various sizes (*See* fig. *B.*) from $\frac{1}{700}$ to $\frac{1}{4200}$ of an inch, and even smaller, according to the distance at which the glass slide had been held; hence the size is dependent on the union of one or more of the small globules,

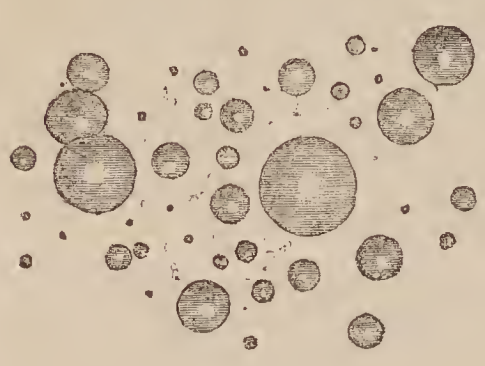


Fig. *B.*

so that, if the glass slide is kept very near to the orifice, the globules will unite together into one mass, as represented in fig. 11. These globules are semi-fluid, which is proved by gently passing a glass rod over them, when they are drawn in long filaments like a resinous substance. This condition of the globules has already been noticed by Frankenheim. (*See* Poggendorf's Ann. xxxix., p. 376—384.)

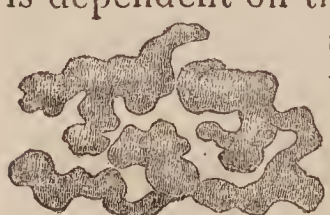


Fig. 11.

If these globules be kept from the influence of light and left undisturbed, they loose their transparency and become solid, but retain their smooth globular forms, as in fig. *C.* Thus, they are found in the dark chambers in which the sulphur has been deposited by sublimation.

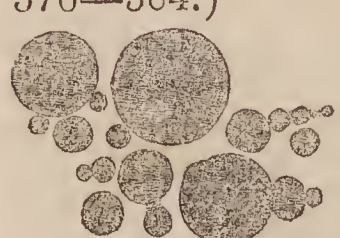


Fig. C.

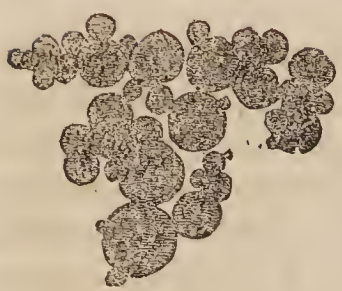


Fig. *D.*

But these globules undergo a gradual and interesting change when the glass-slide, upon which the freshly sublimated sulphur has been deposited, is shaken and exposed to light. Several globules unite at first into one, as in fig. *D.*

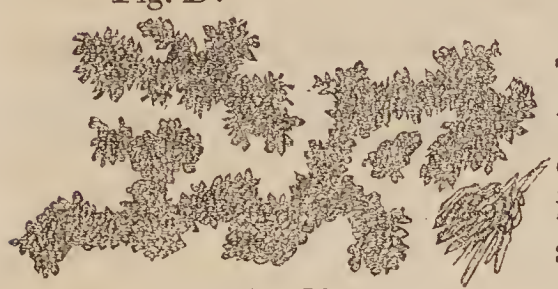
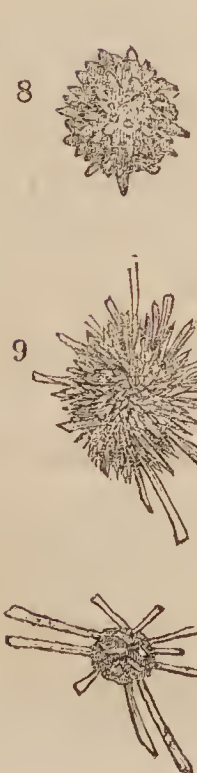


Fig. *F.*

They lose at the same time their transparency, their surface becomes rough, and at last unite into larger semi-globular masses as in fig. *F.*

From these masses are growing out small indistinct crystals, which, after a few days, increase, and become more distinct, whereby those dark points from which the crystals emanated, become lighter. The figures 6, 7, 8, 9, 10 represent, in single large globules, these gradual changes. (Figs. 1, 2, 3, 4, 5, show merely the smallest size of globules).

The whole mass is frequently changed into transparent crystals, whose diameter is often nearly thrice as large as that of their globules, *see* fig. 12. These crystals are quite transparent and some are perfect, forming an elongated octohedron with a rhomboidal base.



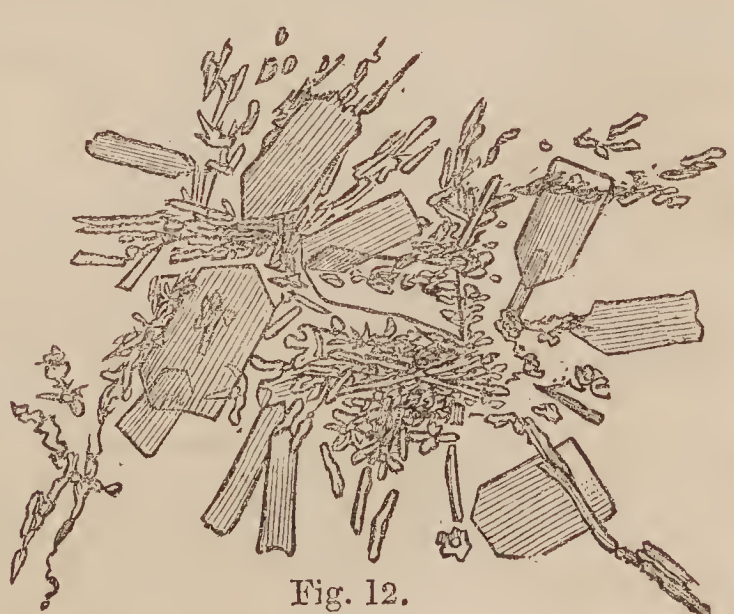


Fig. 12.

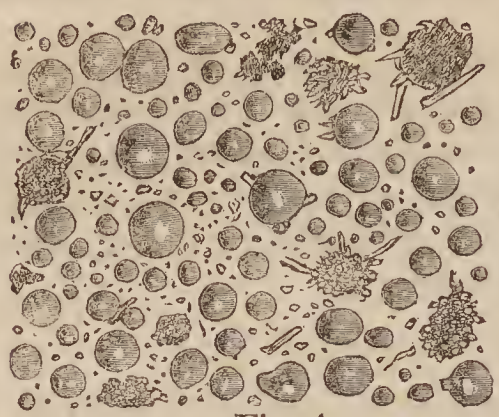


Fig *A*.

A glass slide filled with sulphur-globules will exhibit all these changes, from the semi-fluid transparent globule to the transparent crystal of which fig. *A*. gives a faithful representation.

The foregoing will sufficiently illustrate the existing difference between lac sulphuris and the sulphur obtained from the various other methods.

Royal German Spa, Brighton, Dec. 1842.

Mr. Scholefield observed, in reference to the contamination of hydrochloric acid with arsenic, alluded to by Mr. Schweitzer, that a method had recently been suggested for removing the arsenic; namely, to agitate the acid in contact with a small portion of mercury.

DONATIONS TO THE LIBRARY.

		Presented by
Leonardi's Speculum Lapidum	1610	Mr. Tylee (Bath)
L'Œconomie des Trois Familles du Monde Sublunaire	1625	Mr. Tylee (Bath)
Fuller's Pharmacopœia Extemporanea	1740	Mr. Woolley (Regent Street, Westminster)
Kirkpatrick's Advice with Regard to Health	1768	Mr. Woolley (Regent Street, Westminster)
Jackson on Sympathy	1781	Mr. Woolley (Regent Street, Westminster)
Saunders's Institutes of Therapeutics	1790	Mr. Woolley (Regent Street, Westminster)
Cullen's Nosology	1800	Mr. Woolley (Regent Street, Westminster)
Clarke's Practice of Physic	1811	Mr. Woolley (Regent Street, Westminster)
Miller's Disquisitions in the History of Medicine	1811	Mr. Woolley (Regent Street, Westminster)
Thomson's Elements of Materia Medica and Therapeutics	1843	Dr. A. T. Thomson.
The Bengal Dispensatory, Dr. O'Shaughnessey		Dr. P. H. Green.
The Treasure of Evonimus, conteyninge the Wonderfull Hid Secretes of Nature, touchinge the most apte Formes to Prepare and Destyl Medicines, &c.	1559	Mr. C. F. Buckle (Peterborough)

DONATIONS TO THE MUSEUM.

Mr. Taylor, *New Bridge Street*.—Sublimed Indigo.

Mr. Bell.—Sodæ Sulphas, impure—Ditto, pure.

Mr. G. Bennett, *Newark*.—Ten specimens of Minerals.

Messrs. Davy, Macmurdo & Co.—Acetate of Lead, in fine crystals—Nitrate of Potassa, in fine crystals.

Messrs. S. & G. Allen, *Cowper Street, Finsbury Square*.—Specimens of Turkey, Indian, and English Rhubarb, in powder—Essential Oils of Almond, Juniper, Caraway, and Pimento.

APPARATUS.

Messrs. Davy, Macmurdo & Co.—Table of Chemical Tests, coloured.

Mr. Woolley, *Regent Street, Westminster*. — Case of Hydrometers, complete.

Mr. Edward Richardson	53, Davies Street, Berkeley Square
Mr. James Richardson .	6, Mount Street, Grosvenor Square
Mr. Robert Read . . .	Devizes
Mr. Thomas Doughty .	3, Francis Place, Holloway

PROVINCIAL TRANSACTIONS.

THE ESTABLISHMENT OF A BRANCH SCHOOL OF PHARMACY AT MANCHESTER.

Messrs. Danson, Standring and Woolley, having been appointed as a sub-committee to make arrangements for the establishment of a School of Pharmacy, they waited on the lecturers and managers of the Medical School, who cordially approved of the plan, and promised their assistance in carrying it out. A special meeting of their body having been called, it was resolved to allow the members of the Pharmaceutical Society the use of their lecture room and laboratory, under the superintendence of the chemical lecturer of the Medical School.

A general meeting of the Members of the Pharmaceutical Society, residing in the Manchester district, was held at the Mechanics' Institution on the 14th of December, to receive the report of the sub-committee. A course of twelve lectures on Pharmaceutical Chemistry was proposed [*see* the Synopsis below] and upwards of thirty members present engaged to take tickets for their assistants and apprentices. An arrangement has since been made with Mr. Davies, and the first lecture was delivered on Wednesday, the 11th of January, at two o'clock, p.m. Above fifty members and associates attended, forty of whom have taken tickets for the course. Some of the students reside in Bolton, Bury, and Rochdale, eleven, twelve, and nine miles from Manchester, on which account it is arranged that the length of each lecture shall be an hour and a half instead of an hour. The officers of the Medical School have shown a disposition to render all the assistance in their power to the Pharmaceutical Society in this endeavour to establish a systematic education in our department, and the members and associates have come forward in support of the rising school to an extent beyond what might have been expected. The Committee look forward to instituting a course of lectures on Medical Botany in the spring.

THE FOLLOWING IS THE

SYNOPSIS

OF A COURSE OF TWELVE LECTURES ON

PHARMACEUTICAL CHEMISTRY,

commencing on Wednesday, 11th January 1843, at two o'clock, p.m., (to be continued every Wednesday, at the same hour, until completed) in the Theatre of the Royal Medical Institution, Pine Street. By John Davies, Esq., Lecturer on Chemistry in the same Establishment, Analytical and Consulting Chemist, &c.:

1. Attraction in general. Various kinds. Nature and Phenomena of Chemical Action. Precipitation. Filtration. Outline of Chemical Analysis,

2. Specific Gravity. Modes and Instruments of determining it in the case of Solids, Liquids, and Gases. Laws of Chemical Action. Their application to practical purposes. Atomic Theory. Nomenclature. Chemical Equivalents. Their use in calculations.

3. Spontaneous Changes. Putrefaction. Fermentation. Vapours. Sublimation. Distillation. Alcohol. Ethers.

4. General Character of the Gases. Oxygen. Hydrogen. Formation and Properties. Water. Mineral Waters, and modes of examination.

5. Chlorine. Hydrochloric Acid. Sulphur. Sulphuric Acid. Purity and Strength of Acids.

6. Nitrogen. Nitric Acid. Purity and Strength. Atmospheric Air. Its nature and properties. Sulphuretted Hydrogen (Hydrosulphuric Acid.) Sulphurous Acid.

7. Carbon. Formation and Properties. Carbonic Acid. Carbonic Oxide. The Hydrocarburets. Coal Gas. Oil Gas. Illumination.

8. Iodine. Bromine. Boron. Fluorine. Phosphorus. Their principal Compounds.

9. Organic Acids. Ammonia.

10, 11, and 12. Alkaline Metals and their Compounds. Earthy Metals and their Compounds. The ordinary Metals. Their Ores. Production. Properties. Compounds. Processes for determining the nature and estimating the value.

Tickets for the Course may be obtained from Mr. WOOLLEY, Chemist, King Street.

Admission for Members and Associates of the PHARMACEUTICAL SOCIETY, and the Apprentices of Members, Half a Guinea each. For those unconnected with the Society, One Guinea.

ORIGINAL COMMUNICATIONS.

ILLUSTRATIONS OF THE PRESENT STATE OF PHARMACY IN ENGLAND.

BY R. PHILLIPS, F.R.S., &c.

Honorary Member of the Pharmaceutical Society.

THE preparation which I shall next notice, and which I obtained from various Chemists, is liquor ammoniæ. The London Pharmacopœia contains two solutions of ammonia in water—the liquor ammoniæ and the liquor ammoniæ fortior; the latter is an article of the Materia Medica. The specific gravity which it ought to possess is stated to be 0.882; the weaker preparation is directed to be obtained, by decomposing in a retort, ten ounces of hydrochlorate of ammonia by eight ounces of lime, slacked by and mixed with water: from these ingredients there are to be distilled fifteen fluid ounces of liquor ammoniæ, of specific gravity 0.960. This solution is, I believe, prepared on the large scale by manufacturing Chemists, with greater economy, by using sulphate instead of hydrochlorate of ammonia.

I procured this weaker solution from, or rather I *sent* for liquor ammoniæ to, six Chemists, and received under this name various solutions, which I shall presently describe.

Among the Pharmacopœia tests of the purity of this preparation are, that it should give no precipitate with lime water, thus proving the absence of carbonate of ammonia; and that when saturated with nitric acid, nitrate of silver should occasion no precipitation indicating the presence of hydrochloric acid.

The specimens which I received I shall, as on former occasions, merely refer to by numbers.

Liquor ammoniæ.—No. 1. This sample gave no indications of the presence either of carbonate or hydrochlorate of ammonia; its specific gravity was 0.964. It may, therefore, be justly regarded as very nearly perfect; for the difference of density evinces too slight a deficiency of strength to be of much importance.

No. 2. Like the foregoing, this specimen gave no precipitate with lime-water, or with nitrate of silver, after saturation with nitric acid. Its density was 0.947, indicating very nearly 13.5 per cent. of ammonia, but as the Pharmacopœia preparation contains only about 10 per cent., this solution was too strong by 3.5 per cent, or it contained about one-third more ammonia than it ought to have done.

No. 3. The Chemist to whom the prescription for liquor ammoniæ was presented, inquired of the person who brought it, whether it was to be the stronger or weaker preparation. My messenger left him to exercise his discretion as to which he would send; and though the word *fortior* was not added to liquor ammoniæ, and, consequently, though the weaker preparata was intended to be procured, he supplied the stronger one. I found it to be free from carbonic or hydrochloric acid, and its density was 0.879, instead of 0.882, as the liquor ammoniæ fortior ought to be, and consequently it contained more ammonia even than the more powerful medicine. I shall notice, but not dwell upon, the extreme inconvenience, to use a mild expression, which might arise from the internal use or external application of a solution of ammonia, which was of three times the strength it ought to have possessed, and consequently of that which might have been previously employed.

No. 4. This case was the reverse of the last, for instead of liquor ammoniæ of greater power, I received what, in point of fact, was not liquor ammoniæ at all. It gave an immediate precipitate with lime water, and a copious one with solution of chloride of calcium, effervesced strongly on the addition of an acid, and although labelled *liquor ammoniæ,* it was evidently and entirely *liquor ammoniæ sesquicarbonatis.*

No. 5. This sample had a specific gravity of 0.970, so that it was only a little too weak; it gave a precipitate with lime-water, and therefore contained carbonic acid, and after saturation with nitric acid, sulphate of silver denoted the presence of a little hydrochloric acid.

No. 6. The density of this specimen was 0.976, and, therefore, still weaker than the last, containing about 9.5 instead of 10 per cent. of ammonia; neither carbonic nor hydrochloric acid existed in it, but when saturated with nitric acid, it gave a precipitate with nitrate of barytes, showing the presence of sulphuric acid; this I have, however, on former occasions, detected in much larger quantities.

Sodæ sulphas. — Some time since a Chemist informed me, that in making up a prescription, which contained magnesia and sulphate of soda, he was greatly surprised by perceiving a strong smell of ammonia to arise, when they were mixed. I have since sent for and examined several samples of sulphate of soda; and of these about one-third gave out ammoniacal gas, when mixed with lime or magnesia. There is no doubt that the sulphate of soda in such cases, is such as remains after the manufacture of hydrochlorate from sulphate of ammonia, in which a portion of the last named salt exists, perhaps, in combination with sulphate of soda, forming a double salt. It would be extremely easy for Chemists to test this salt previously to using it, by the addition of lime, which would evolve ammonia, as just described.*

Spiritus Ætheris Nitrici. This preparation is obtained by distilling thirty-two fluid ounces of product from a mixture of three pounds of rectified spirit and four ounces of nitric acid.

This being a medicine of considerable importance, and very extensively employed, I sent for it to twenty-two Chemists, and received from all of them, but one, preparations which bore very considerable resemblance to the medicine required; the exception was that of a Chemist, who, instead of sending sweet spirit of nitre, written for in English, supplied me with camphorated spirit of wine: it was however correctly labelled, and no other mistake was likely to arise about it.

The Pharmacopœia states, that the density of this preparation should be 0.834, some which I recently prepared was of specific gravity 0.827; it was colourless, and very slightly acid to litmus paper.

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* We have repeatedly applied to manufacturers for *pure sulphate of soda*, but have not been able until lately to obtain it in small quantities, being told that it would not answer the purpose to make less than half a ton, and that if a portion were left on hand, the TRADE would not give the price for it. We have lately succeeded in obtaining pure sulphate of soda in small quantities (quarter cwt.) from Mr. Price, of Battersea. We feel convinced that the very trifling difference in the expense would not be an obstacle to the sale of the pure article, if it were generally offered by manufacturers. —ED.

It has been shown by Dr. Golding Bird (Lond. and Edin. Phil. Mag., vol. xiv.) that aldehyd is generated, but does not appear in the distilled liquid until the formation of ether has nearly ceased, and with this statement my own observations agree, for I found that, after the proper quantity of product had been distilled, the succeeding portion contained a very large proportion of this substance, to which, according to Dr. Bird, the spiritus ætheris nitrici is indebted for the pungent acrid flavour it frequently possesses, but from which it is nearly free when prepared according to the directions of the Pharmacopœias.

I find that when about equal volumes of sulphuric acid and properly prepared spiritus ætheris nitrici are mixed, very slight change of colour ensues, but the mixture becomes considerably viscid: if, however, it contains much aldehyd, it assumes a dark colour, without the application of heat; and if water or spirit be present in undue proportion, the viscidity to which I have alluded does not occur in so great a degree.

Spiritus Ætheris Nitrici.—No. 1. Specific gravity 0.850; contained much aldehyd.

No. 2. Specific gravity 0.853; contained much aldehyd.

No. 3. Specific gravity 0.931; not much aldehyd. Contained about one-third water.

No. 4. Specific gravity 0.856; not much aldehyd.

No. 5. Specific gravity 0.831; not much aldehyd. From its specific gravity, and its being rendered viscid and but slightly coloured by sulphuric acid, this was, I think, the best sample which I obtained.

No. 6. Specific gravity 0.931; contained much aldehyd, and about one-third water.

No. 7. Specific gravity 0.848; contained a considerable quantity of aldehyd.

No. 8. Specific gravity 0.899; contained but little aldehyd; but more than one-fourth water.

No. 9. Specific gravity 0.852; contained much aldehyd.

No. 10. Specific gravity 0.856; not much aldehyd.

No. 11. Specific gravity 0.912; but little aldehyd. Contained nearly one-third water.

No. 12. Specific gravity 0.900; but little aldehyd. Contained more than one-fourth water.

No. 13. Specific gravity 0.857; contained but little aldehyd.

No. 14. Specific gravity 0.940; aldehyd small in quantity; but it must have consisted of nearly one-half water.

No. 15. Specific gravity 0.854; much aldehyd.

No. 16. Specific gravity 0.900; contained much aldehyd. Water more than one-fourth.

No. 17. Specific gravity 0.894; aldehyd small in quantity; water more than one-fourth.

No. 18. Specific gravity 0.866; some but not very much aldehyd. Water nearly one-fifth.

No. 19. Specific gravity 0.919; aldehyd considerable, water about one-third.

No. 20. Specific gravity 0.949; very little aldehyd. The proportion of water the largest in any sample; probably, amounting to more than one-half.

No. 21. Specific gravity 0.878; sulphuric acid did not evince the presence of any aldehyd, and the viscidity it occasioned was so slight as to denote the almost total absence of ether.

The Chemist from whom I received this is one of some pretension, and I also procured from him some liquor potassæ; happening from an accidental circumstance to discover that it was for me, he informed my messenger that he would not warrant that it was chemically pure, but that it *was sufficiently so for the purposes of medicine.* On examination, I found he was right as to its not being pure, for when added to spiritus ætheris nitrici, a crystalline salt was deposited, which certainly contained sulphate of potash, and, as I presume, chloride of potassium also, for nitrate of silver gave an abundant precipitate with the liquor potassæ, after saturation with nitric acid.

I am not aware of the existence of any process for the separation of hyponitrous ether from the spirit with which it is mixed to constitute spiritus ætheris nitrici. In the Edinburgh Pharmacopœia, hyponitrous ether is first prepared, and then it is mixed with four times its volume of rectified spirit to form the spiritus ætheris nitrici; it is further stated in this work, that when the spirit thus prepared is agitated with twice its volume of concentrated solution of muriate of lime, twelve per cent. of ether slowly separate. As then the spirit contains twenty per cent. of ether, it is evident that eight per cent. must remain dissolved by the solution of muriate of lime. Dr. Christison remarks, that the preparation of the London College, when treated in this manner, "never yields more than four [per cent.] and sometimes none." It is however to be observed, that the preparation which yields only four per cent. by this process must contain twelve per cent., eight being absorbed by the muriate of lime, and even that which Dr. Christison states he found to contain no ether at all, might have contained eight per cent., which would all be absorbed. How the same process should sometimes yield twelve per cent. of ether, and at other times none at all, if it be properly conducted, I confess I am unable to discover. Even the imperfect preparations which I have above described, all, I believe, contained some ether.

ON THE METHOD OF DETECTING IMPURITIES IN IODIDE OF POTASSIUM.

Iodide of potassium, in a state of purity, has the following characters, any deviation from which must be looked upon with suspicion, and its cause carefully sought for. The crystals are perfectly white, transparent, or semi-opaque; the figure is the cube, either simple and distinct, or grouped together into pyramids or steps, like the crystals of bay salt; occasionally the planes of the cube are modified by the appearance of secondary faces, but this is not common. The salt is permanent in the air, only deliquescing in a very damp atmosphere; it is very soluble in water, and the solution is neutral to test-paper; strong alcohol also dissolves it, but not nearly so readily. A mineral acid, added to a solution of iodide in sufficient quantity, decomposes it, liberating the iodine, which colours the liquid brown; there is no effervescence. Lastly, it is fusible at a red heat, without decomposition.

The most common impurity of the commercial salt is carbonate of potash. When this substance is present in any quantity, the crystals are usually small and confused, the whole mass becomes moist on exposure to air, and the solution has a powerful alkaline re-action to test-paper, and effervesces when mixed with acid.

This admixture of carbonate arises from unskilfulness of manufacture; there are, as most persons know, two principal methods in use for preparing the iodide, first, to decompose exactly by solution of carbonate of potash, iodide of iron or zinc, obtained by acting on the metal with iodine diffused in water; or secondly, to add iodine in excess to a strong solution of caustic potash, whereby the latter becomes converted into a mixture of iodide of potassium and iodate of potash. This solution is then evaporated to dryness and exposed to a gentle red heat, by which the last named salt is further resolved into iodide of potassium and oxygen gas which escapes. In the first of these processes, if the precipitation of the metallic oxide be not very carefully conducted, the alkaline carbonate may be added in great excess, and the resulting salt thus rendered impure; while, in the second, if the caustic potash employed contain any notable quantity of carbonate, the latter will escape decomposition by the iodine, and contaminate the manufactured article.*

Mr. Scanlan informs us, that in operating on large quantities, it is difficult to ensure the entire decomposition of the iodate of potash by heat alone; to obviate which difficulty, he is in the habit of adding finely powdered wood charcoal to the dried mass

* Geiger, *Handbuch der Pharmacie*, 363.

previously to fusing. By this means the decomposition of the iodate is greatly facilitated, the oxygen being evolved in the form of carbonic acid.

Dr. Pereira observes, in his Materia Medica (second edition),

"In the first edition of this work I mentioned that I had met with a variety of iodide of potassium, which, by keeping, underwent decomposition, evolved an odour of iodine, and became yellow. As it yielded me, on analysis, iodine and potash only, I was unable to account for the changes referred to. Mr. Scanlan* has since explained them, and shewn that this variety of iodide of potassium is contaminated with *iodate of potash*, the presence of which has been already accounted for. It may be readily detected by adding to a solution of the suspected iodide, a solution of tartaric acid. If the iodide be pure, the resulting liquor is at first colourless, but becomes quickly yellow by the action of atmospheric oxygen on the hydriodic acid which is thus generated. If, however, iodate of potash be also present, a quantity of free iodine is instantly developed. This arises from the mutual re-action of the disengaged hydriodic and iodic acids, by which water and free iodine are generated. Whether iodate be present or absent, the addition of tartaric acid causes the precipitation of crystals of bitartrate of potash.

"Iodide of potassium is readily contaminated with metallic matter derived from the vessels in which it is crystallized. I have samples of it, in octohedral crystals, which contain traces of lead and tin, derived, I presume, from the metallic vessels in which they have been prepared."

The iodide of potassium of commerce sometimes contains traces of common salt, or chloride of potassium—bodies which crystallize in the same form as the iodide, and greatly resemble the latter in nearly all their physical characters; it may be remarked, however, that both these bodies are less soluble in water than iodide of potassium, and scarcely at all soluble in spirit.

A solution of iodide of potassium gives, with nitrate of silver, a very abundant curdy precipitate of iodide of silver, insoluble in nitric acid, and having a pale but distinct yellow colour. A solution of a chloride under similar circumstances affords a curdy precipitate of chloride of silver, insoluble in nitric acid, but perfectly white. These two silver salts are further distinguished by the chloride being freely soluble in caustic ammonia, while the iodide scarcely possesses the slightest degree of solubility in that re-agent. Indeed, this peculiar property of resisting the solvent power of ammonia, very uncommon among salts of silver, gives us an excellent method of detecting in a soluble iodide the smallest admixture of chloride. The mode of proceeding is as follows:

The salt to be examined is dissolved in water, mixed with a slight excess of nitrate of silver, and then a quantity of ammonia is added; the filtered solution now contains all the chloride of silver held in solution by the ammonia, and by acidulating it with nitric acid, that substance is precipitated with its usual characters.

When pure iodide of potassium is tried in this way, the am-

* See Pharmaceutical Journal, vol. i. page 418.

moniacal liquid hardly exhibits the faintest opalescence with nitric acid, but when a little chloride has been added, the latter is brought out in the most distinct and unequivocal manner.

The presence of a sulphate may be detected by adding chloride of barium to a solution of the salt, when, if it contain any sulphate, a white precipitate, insoluble in nitric acid, will be thrown down.

ON FERMENTATION.

TO THE EDITOR OF THE PHARMACEUTICAL JOURNAL.

Sir,—In your last publication, a correspondent (J. P. B. of Chertsey) making some observations upon the process of fermentation, seems desirous of eliciting any hint upon this subject, which he justly designates an interesting and useful part of domestic economy.

I am therefore induced to observe, that some years ago, in preparing British wines, I was in the habit of using about six drachms of sesquicarbonate of soda, and four drachms of tartaric acid, to every twenty gallons of liquor. From this simple addition I have found fermentation take place more speedily and to be more certain in its results; I have not observed any ill effects to the wine so produced in any way. Having no opportunity of trying the same method with ale, I of course do not speak confidently to the same result, though I am inclined to believe it would be similar; perhaps, however, a somewhat larger quantity of each ingredient may be necessary. Should J. P. B. think proper to make a trial of it, I would recommend the acid and soda to be added to the wort in separate solutions, the soda as soon as the wort is cool in the barrel and the acid the following day; avoiding exposure of the wort to the air as much as possible. Your correspondent so experimenting will, perhaps, oblige by a further communication upon the subject.

I am, Sir, yours, &c.,

Liverpool, 17*th January*, 1842. Joseph Ball.

MARKING INK,

THAT REQUIRES NO PREPARATION.

BY MR. B. C. ROWLAND.

A year has now elapsed since an article, by Mr. A. Burgess, appeared in the Pharmaceutical Journal on the subject of Marking Inks, requiring no preparation, relative to their liability to form explosive compounds, as frequently prepared; and pointing out the extreme danger attending the precipitates formed by ammonia and its carbonate in solutions of the salts of silver. In

the article to which I advert, questions are put to the readers of the Journal, which from their useful and important nature, in connexion with the dispensing Chemist, it might be supposed would have been speedily answered by Chemists more competent than myself.

No doubt, *mystery* formed the greatest charm of the old followers of our art, in vending their wonderful compounds to their own pecuniary benefit; but it is now more the spirit of the times to show a greater degree of liberality in communicating information, more especially connected with chemical subjects.

In giving my own method of making the marking ink, requiring no preparation, I may state, that I have been in the habit, for some years, of preparing this article for sale, and have found it superior, when properly prepared, to any that I have met with—in being perfectly fluid, free from precipitate, and not liable to run or blot the fabric written upon, and also in being as indelible, perhaps more so, on account of the heat that is employed, than that which requires a mordant.

The question, whether a marking ink can be made indelible, has, for some time, been raised, as the "silver" inks have been found to give way to various agents; my own opinion is, that unless the fluid written with combines chemically with the cloth, so as partially to change its substance, that all metallic inks may be extracted. For instance, when a heated iron is applied to the surface of the cloth, after writing with the ink, requiring no preparation, or if the part be held to the fire, it will be found that the cloth has been carbonized to a certain extent, without materially injuring the fabric; and if carefully managed, nothing short of destroying the substance can remove the writing.

It will be seen that this ink contains two metallic nitrates, with excess of ammonia; the combination may be more curious than chemical, but I have found that the copper exerts a great influence over the silver in preventing its liability to blot when written with. It is however necessary to observe, that although the proportion of ammonia should be sufficient to keep the fluid clear, yet there must be no uncombined excess, and I find the best method after the ingredients are mixed, is to put the fluid in a small evaporating dish over a lamp, and keep up a gentle heat for ten minutes, to disengage the free ammonia.

On opening a bottle I have had put up twelve months, I find there is no sediment, nor is there any smell of ammonia, but on holding a drop of hydrochloric acid over the surface, I find an indication of its presence. This is the form:—

℞ Argenti Nitratis Crystallorum, ʒiij.
Liquoris Ammoniæ fortissimi, ʒij. Solve.

℞ Cupri, ʒss.
Acidi Nitrici, q. s. Solve, tum adde Liquoris Ammoniæ fortissimi ad saturationem.

℞ Pigmenti Indici [*vulgo* Indigo], gr. iij.
Levigatur cum Aquæ Destillatæ, ʒi.
et adde Carbonis Puri, gr, vi.
Pulveris Gummi Acaciæ, ʒi.

Mix the whole of these ingredients together, and add a sufficient quantity of ammonia to form a bright mixture, and when a gentle heat has been applied to drive off the excess of ammonia, the fluid will be ready for use.

Liverpool, 1, *Great Homer Street*, *January*, 1843.

CEMENTS.

(RECOMMENDED BY MR. B. C. ROWLAND.)

℞ Pulv. Mastic.
" Acaciæ, aa. ʒj.
" Cretæ. ppt. ℈ij. Misce.

This should be kept in powder for use, and when required it should be made into a stiff paste with a little water. This is a very hard cement, and well adapted for china, glass, &c.

India Rubber } Equal quantities of each,
Shellac }

Dissolved in naphtha, form a cement, insoluble in boiling water, and on this account invaluable for many purposes.

1, *Great Homer Street*, *Liverpool.*

ON LEECHES.

BY MR. JAMES BAYNES.

Some months ago, Mr. Fordred suggested that a few practical remarks on Leeches might be acceptable to the readers of your Journal. Having been several years with the largest importer of leeches in England, I venture on the following observations, confining myself to such as may be useful to the retailer:

Leeches are usually sent out by the wholesale dealers packed in kegs or bags, in which manner they may be sent a journey of several days.

On receiving the leeches turn them out into a jar, and pour upon them water to the depth of two or three inches, let them remain a few hours, then add more water, and stir the leeches briskly with the hand, or what is better, a small whisk. When well cleaned, put them into a jar about one-third filled with moderately soft water—the water must be changed as required, about twice a week in winter, and every other day in summer, will suffice if the leeches be healthy.

For the purpose of preserving them in a healthy state, when the water is changed, they should be well scrubbed with a whisk

made of very fine broom or willow. This method will be found to answer much better than putting earth, moss, sand, &c. into the jars. When it is requisite to keep leeches a considerable length of time, they should be put into jars containing a mixture of well-tempered clay and water, rather thick, water being occasionally added to prevent the clay becoming too stiff; in this way they may be kept longer than by any other method, except ponding.

Healthy leeches readily contract themselves when squeezed in the hand; if, on the contrary, they remain soft and flabby, they are considered unhealthy and not to be depended upon; although it sometimes happens, especially in summer, that perfectly healthy leeches, after having travelled some distance, do not answer this mode of testing them, but remain rather flaccid, probably from exhaustion or sudden changes in the atmosphere during their journey; the treatment recommended at the commencement of this paper will generally be found to restore them in a few hours. Other modes of judging of their healthiness are known amongst the wholesale dealers; should they have a soft unctuous feel, they are considered weak, and require ponding some months to restore their vigour; if on being handled they remain elongated, or if small pustules appear on the body, or the mouth be discoloured and swollen, they are generally irrecoverable, and rapidly die off. Leeches are subject to several diseases, which it is not necessary to describe, as the only remedy likely to be of service, is placing in ponds, which is a plan the retailer cannot adopt. Porter, port wine, charcoal, and many other remedies have been suggested, but they are of very doubtful efficacy—frequently changing the water, and treating as before directed, will be found the plan most likely to succeed.

The best kind of jars for keeping leeches in are the brown-ware, rather rough in the inside, and of a size to hold about two gallons, about 250 leeches may be put into a jar of this size, about one-third filled with water.

Leeches should be kept in a cool dark place, especially if required to be preserved a length of time; strong light appears to render them uneasy. It is better not to mix two parcels of leeches together, as they sometimes bite each other very much.

Hide, January 12th.

PHARMACEUTICAL NOMENCLATURE.

Sir,—Your last article on Pharmaceutical Nomenclature has induced me to give you an example of the danger in adopting names for different articles in the Pharmacopœia so nearly

resembling each other. Last evening an apprentice, who has been seventeen months at the business, was left in care of the shop while I attended church; a prescription was left as follows:

℞ Hydr. Potassaæ ʒiss,
Syr. Croci ʒi,
Aquæ ʒvij M. capiat,
Cochl. ampl. ter in die.

The youth has had strict orders never to prepare any medicine that he has the least doubt upon; the medicine was wanted immediately, and on referring to the Pharmacopœia, found the only preparation of potash with the above commencement is Potassæ *Hydras;* this he used, and fortunately only one dose having been taken, and the proper antidotes being administered early, the patient is not likely to feel any ill effects from it; it is almost needless to say the Physician meant Potass Iodidi. I showed the prescription to the Physician this morning, and explained the error that had arisen. I had a prescription this evening, as follows:

℞ Acid *Hydroc.* dil,
Aquæ Rosæ aa ʒij M,
Capiat gutt viij ter in die ex aqua,
(Acid hydrocyanici dil) is meant.

I merely send you these as examples, to show, that unless medical men are clearer in their directions, uncertainty will exist in dispensing their prescriptions.

I am, Sir, your obedient Servant, A Member, a.

THE PERFORATION OF GLASS.

TO THE EDITOR OF THE PHARMACEUTICAL JOURNAL.

Dear Friend,

Observing in the Replies to Correspondents that we know of no *chemical* agency by which thick flint glass may be perforated, I apprehend a mechanical method may answer the purpose. It is not a new discovery, but it has often been very useful to me—it is the employment of oil of turpentine to moisten a drill or other instrument. By this means, with a brad-awl, I have perforated very thick glass, both flint and green. With a three-cornered file well wetted from time to time with this fluid, it is easy to perforate any glass vessel, or extract any stopper with very little risk. I am thine truly,

Sloane Square, 12th mo. 17, 1842. Robert Alsop.

EXTRACTED ARTICLES.

COLLECTION OF OPIUM IN ASIA MINOR.

Much opium is produced in this neighbourhood, [*Bogaditza*]; it is obtained by making a circular incision nearly all round the central circumference of the seed-vessel, but not quite through to the seeds. This is done in the evening; and a few drops of a white milky juice exude from the incision, which become hard during the night, and are scraped off the following morning with a peculiarly shaped knife, when it has acquired the consistency of butter, and a slight brownish colour; it then gradually hardens, and in a few weeks becomes almost black. It is made into lumps about four or five inches in diameter, round which leaves are laid to prevent their sticking together, and in this state it is delivered to the government agents. By this process the seed is not at all injured, and is afterwards gathered and dried for the following year. The opium is chiefly obtained from the single white poppy: I have also seen the red and purple colours, though only one is usually seen in a field. I hardly remember to have noticed any mixture of colour in one piece of ground; the kind here cultivated generally grows to a height of three feet.—*Hamilton's Researches in Asia Minor, Pontus, and Armenia,* vol. ii., p. 115, 1842.

COLLECTION OF TRAGACANTH.

"The only peculiar production which I observed" [at *Buldur*], "was a white flaky gum, brought in by the peasants, and exposed in large quantities for sale. It is the gum tragacanth, called by the Turks "ketereh," under which name large quantities of it are sent to Smyrna. It is collected in the neighbouring hills from a low prickly plant, resembling a species of furze. The gum is obtained by making an incision in the stem, near the root, and cutting through the pith, when the sap exudes in a day or two, and hardens in the opening, after which it is collected by the peasants. Its price was thirty-six piastres per oke, or about 3*s.* 2*d.* per lb."—*Ibid.* vol. i., p. 192-3.

ON THE COMPOSITION OF BUTTER.

BY C. BROMEIS.

According to the analysis of Bromeis, fresh butter has the following composition:—

Margarate of the oxide of glycerule	68
Butyroleate of ditto	30
Butyrate, caproate, and caprate of ditto	2
Fresh Butter	100

The *margarate of the oxide of glycerule* is pure margarine. He procured from it an acid identical, not only in its physical properties but likewise in its atomic composition, with margaric acid.

The author obtained, by expression, from butter, an oil [*butyroleate of glycerule*] from which he procured *butyroleic acid.* This like most of the fatty acids is an unibasic acid, in the salts of which one atom of water is replaced by one atom of base. The following are the formulæ which agree best with the results of the analysis of this free and hydrated acid, and of the butyreoleate of baryta.

		Per Cent.
34 atoms of carbon	2598.79	74.55
31 atoms of hydrogen	386.86	11.10
5 atoms of oxygen	500.00	14.35
1 atom hydrated butyroleie acid =	3485.65	100.00
34 atoms of carbon	2598.79	60.01
30 atoms of hydrogen	374.39	8.64
4 atoms of oxygen	400.00	9.25
1 atom of baryta	956.88	22.10
1 atom of butyroleate of baryta =	4330.06	100.100

According to Chevreul the formula for *butyric acid* is $C_8\ H_{5.5}\ O_3$. But Bromeis gives as the formula, for the hydrated acid, $C_8\ H_6\ O_3 + H\ O$; and, for the butyrate of baryta, $C_8\ H_6\ O_3 + Ba\ O$.

The author suggests the possibility of the formation of butyrie, caproïc and capric acids by the oxidation of butyroleic acid, and the formation of water.

4 atoms of butyroleie acid	$C_{136}H_{120}O_{16}$	8 atoms of butyric acid	$C_{64}\ H_{48}\ O_{24}$
40 atoms of oxygen	— — O_{40}	3 atoms of caproïc acid	$C_{36}\ H_{27}\ O_9$
		2 atoms of caprie acid	$C_{36}\ H_{28}\ O_6$
	$C_{136}H_{120}O_{56}$		$C_{136}H_{103}O_{39}$
		17 atoms of water	— $H_{17}\ O_{17}$
			$C_{136}\ H_{120}\ O_{56}$

Annalen der Chimie und Pharmacie, April, 1842.

COMPOSITION OF THE MUSCULAR FLESH OF DIFFERENT ANIMALS.

BY SCHLOSSBERGER.

The writer examined the flesh of the ox, the calf, the hog, the sheep, the buck (of 3½ weeks old) the roe, the hen, a young pigeon, a very young duck, the barbel, the trout, and the crayfish. All contained *fibrine, cellular tissue, liquid albumen, animal matters soluble in alcohol, extractive matter soluble in water only, salts*, and, while fresh, more or less *free lactic acid.* The albuminous coagulum varied according to the quantity of intermixed blood; in the younger animals being less coloured. It was formed more speedily in the flesh of the fish and the crayfish, and invariably yielded, by incineration, phosphorus, sulphur, and iron. The pigment was entirely absent in most fishes, and had a more fatty or resinous character in the crayfish. The hæmatosine, whenever found, was always the same. The quantity of contained blood increased with the age, and appeared to be in inverse ratio with the water, but in direct ratio with the contained fibrine. All the kinds of flesh contained *osmazome.* This was a brownish yellow,

non-gelatinous extractive matter, having an aromatic odour and an acrid taste, and being soluble in water and alcohol. It increased with the age and with the height of the animal in the scale of organization. The fibrine was everywhere the same. The relative proportions of the constituents were as follows :

	Ox.	Calf.	Hog.	Roe.	Pigeon.	Chicken	Carp.	Trout.
Fleshy fibres, vessels, nerves, and cellular tissue ..	17.5	15. — 16.2	16.8	18.	17.	16.5	12.0	11.1
Soluble albumen and hæmatosine	2.2	3.2— 2.6	2.4	2.3	4.5	3.0	5.2*	4.4
Alcoholic extract and salts	1.5	1.1— 1.4	1.7	2.4	1.0	1.4	1.0	1.6
Watery extract and salts	1.3	1.0— 1.6	0.8		1.5	1.2	1.7	0.2†
Phosphate of lime, containing albumen	Traces	0.1 Traces.	Traces.	0.4	..	0.6	..	2.2‡
Water and loss	77.5	79.7— 78.2	78.3	76.9	76.0	77.3	80.1	80.5
	100.0	100.0—100.0	100.0	100.0	100.0	100.0	100.0	100.0

Valentin's Repertorium.

PRESERVATION OF THE HUMAN BODY.

A GENTLEMAN from Canada died at Philadelphia. To enable his family to take him home Drs. Grant and Sharpless undertook to preserve the body. The weather at the time was very sultry with rain and sun nearly every day. A saturated solution of corrosive sublimate in alcohol was thrown into the aorta below the superior mesenteric artery — a quart upward and a pint downward, and the body was kept damp by a weaker mixture. The next day the same quantity of a saturated solution of the acetate of alumina was injected, which had the immediate effect of giving the whole body a manifest rose colour, making it resemble life in a remarkable degree. The face and hands were kept constantly damp with the solution and the body frequently washed with it. The next day the same quantity, and the day following a pint more, were injected. The body was placed in a coffin, with cotton wadding dipped in alcohol around the face and hands. It was removed the day after, and arrived at home but little changed, the eighth day after death. There was a slight odour, but not of putrefaction, or any other indications of such a change. (*Condensed from the London Medical Gazette.*)

[A cheap and powerful antiseptic is arsenious acid. Bodies injected with a saturated solution holding in suspension some of the fine powder of this acid, may be preserved for a couple of months even in the height of the summer season.—*Ed. Ph. Journal.*]

CASE OF POISONING WITH HYDROCYANIC ACID—RECOVERY.

IN the month of May last the following case occurred, which shews the absolute necessity of caution in the administration of hydrocyanic acid,

* Pure coagulable albumen.
† Insoluble in water after evaporation,
‡ Including a peculiar watery extractive.

even when it may be supposed to have nearly lost its efficacy by keeping. The case is reported by Mr. George Garston, Surgeon, Stromness, Orkney. Mr. A. W. had been in the habit of taking a mixture containing opium and hydrocyanic acid, to relieve uneasy sensations about the head and heart. On the 23d of May, being engaged in writing, and the usual dose having failed to give relief, he swallowed nearly a teaspoonful of hydrocyanic acid, which had been some time in his possession, and which appeared almost entirely to have lost its properties. The family were alarmed by hearing a groan, and the patient was found breathing irregularly, the jaws fixed, face covered with cold perspiration, a gurgling noise in the throat, pulse weak and quick. The empty bottle, labelled *hydrocyanic acid*, being on the table, Mr. Garson, who shortly arrived, proceeded to treat him accordingly; pouring cold water along the spine and over the head, and introducing ammoniated alcohol into the mouth. Solution of chloride of lime was also administered. The temperature of the extremities being very much reduced, mustard cataplasms were applied to the legs, arms, and breast, and hot stones to the feet. Rigors, vomiting, sore throat, and occasional convulsions, continued with variable severity during the day, together with a difficulty of deglutition and an abundant flow of saliva. In the course of a few days the patient entirely recovered.—*Condensed from the Edinburgh Medical and Surgical Journal, Jan.* 1843, *p.* 72.

[In addition to the very judicious treatment adopted by Mr. Garston, and to which the patient owes his life, Dr. Pereira strongly recommends *artificial respiration.* The patient being laid on his back (on a table or the floor) powerful pressure is to be made on the front surface of the chest, with both hands, while an assistant presses on the belly, to force up the diaphragm. In this way the air is expelled from the chest. Then by the sudden removal of the pressure, and the consequent resilience of the ribs, &c., an act of inspiration is effected. From fifteen to twenty respirations should be made per minute. If the air respired be faintly impregnated with chlorine gas (generated by adding muriatic acid to chloride of lime contained in a basin), the beneficial effect is greatly augmented.—Ed. Ph. Journ.]

PROCESS FOR THE QUANTITATIVE DETERMINATION OF CHLORINE.

BY M. J. L. LASSAIGNE.

Several methods have been already pointed out for estimating the quantity of chlorine, either contained in a free state in water, or afforded by the decomposition of the hypochlorites in contact with acids. These methods, so useful where chlorine is employed in the arts, are founded on two principles: first, on the quantity of solution of indigo, of known strength, which a volume of dry chlorine gas, at a fixed temperature and pressure, is capable of discolourizing; secondly, on the reaction of chlorine gas, on arsenious acid. The modifications adopted in the latter process by Gay Lussac have rendered it preferable in every respect to the old method, which frequently gave false indications, arising from the alteration which the solution of indigo undergoes under the influence of light, and in the course of time, even when excluded from light.

The process which I now submit for the approval of Chemists, and which I have had occasion to submit to a comparative trial with the indigo process, appears to have a decided advantage over that, in the inalterability of the test liquor employed, and the uniformity of the results which are afforded.

The new process is founded on the exact determination of the quantity of dry chlorine gas which is required to decompose a given weight of pure iodide of potassium, so as to transform it into *chloride of potassium* and *perchloride of iodine*, which is soluble in water. The complete decomposition of the iodide is easily ascertained, by means of a small quantity of solution of starch, which, mixed with the solution of the iodide employed, at the moment of adding the solution containing the chlorine, will be immediately coloured successively blue, violet, green, red, and yellow, while there remains the least quantity of free iodine. As soon as the decomposition is completed, the liquor becomes as transparent and limped as distilled water. This completion of the re-action in this case, admits of being determined with much greater accuracy than that which takes place with the sulphate of indigo, which, as is known, always remains more or less of a redish yellow colour.

An equivalent of pure and fused iodide of potassium, requires for its complete decomposition into chloride of potassium and perchloride of iodine, six equivalents of dry chlorine. There results from this re-action, one equivalent of chloride of potassium, and one equivalent of perchloride of iodine, formed by the equivalent of iodine separated, and which combines with five equivalents of chlorine. According to this theory, sixty-one cubic inches (2.1138 pints) of dry chlorine gas, at a temperature of 32° Fahr., and under a pressure of thirty inches, weighing 47 grains, will decompose 32 grains of iodide of potassium.

Thus on dissolving thirty-two grains of iodide of potassium in sixty-one cubic inches (2.1138 pints) of distilled water, a solution is obtained, which requires for its perfect decomposition, a volume equal to its own of chlorine, or sixty-one cubic inches of the dry gas, under the conditions of temperature and pressure above stated, as direct experiment has proved.

This test solution keeps perfectly well in a wide-mouthed stoppered bottle. For using it, a measured quantity is taken with a small graduated pipette, and put into a common glass, and a small quantity of solution of starch added to it. When it is desired to determine the strength of a simple solution of chlorine in water, the graduated tube with a bent neck, such as is generally used in chlorimetry, is filled with the liquid, which is allowed to fall drop by drop into an equal volume of the test solution of iodide of potassium mixed with solution of starch. As the first drops fall, they give rise to the formation of blue iodide of amidou, which becomes more intense as a greater quantity of iodine is set at liberty, but presently, this iodide is, in its turn decomposed, and the liquor, previously to its becoming quite colourless, passes through the various shades to which allusion has already been made.

The quantities of solution of chlorine employed at an operation to produce complete decolouration, is of course in inverse proportion to the chlorine which it contains, thus, when in an experiment we are obliged to use twenty measures of the chlorine solution to decolourize ten measures of the normal solution of iodide of potassium, the solution must contain only half its volume of chlorine, or 0.50.—*Journal de Chimie Medicale.*

ON THE ATOMIC WEIGHT OF LANTHANIUM.

BY CHOUBINE AND RAMMELSBERG.

Choubine has been engaged in the analysis of the lately discovered mineral *tschewkinits*. It consists of silicic acid, protoxide of iron, cerium, lanthanium, and titanic acid, with a slight admixture of alumina and lime.

To determine the atomic weight of lanthanium, Choubine converted the oxide into a chloride, and into the double salt sulphate of lanthanium and potash. In one experiment he obtained 451.872 as the atomic weight of

lanthanium; in a second, 451.956. The mean of these two is 451.914. In a third experiment, analysis gave 451.879.—*Bullet. de Petersburg*, 1842.

According to Rammelsberg, the atomic number for cerium is 572.8; for lanthanium, 554.88.—*Pogg. Ann.* lv. pp. 64-66.

The cause of the uncertainty which still exists with regard to cerium and lanthanium is somewhat explained by Mosander's announcement, that they are constantly accompanied by a third metal, didym.

A notice of the new metal, *Didym*, appeared in our number for November last, p. 368—Ed. Ph. J.

ON OPIANIC ACID.

BY LIEBIG AND WOEHLER.

This substance is most readily obtained by the oxidation of narcotine in the following manner:

Dissolve narcotine in an excess of dilute sulphuric acid, add to the solution finely powdered binoxide of manganese, and apply heat. It will soon assume a yellow saffron-like colour, and evolve carbonic acid gas. Heat to boiling, which is to be kept up until no more carbonic acid gas escapes. Both the manganese and sulphuric acid must be in excess, for which test, and then filter whilst boiling. In cooling, the fluid will nearly wholly congeal, and form a magma of fine needle-like crystals of opianic acid.

The mass is to be placed on a filter to allow the yellow-coloured fluid to pass off, wash several times with cold water, press as firmly as possible, and remove impurities by treating with animal charcoal, and repeated recrystallization from boiling water.

The opianic acid crystallizes in very small shining silky prisms of indefinite form. It is but slightly soluble in cold water, but the more so in hot; so that a saturated solution, in cooling, nearly wholly crystallizes, like a solution of benzoic acid. It is also soluble in alcohol. It re-acts as an acid, though it has but a faintly sour and bitter taste. It readily melts, and forms a clear oil, which crystallizes on cooling, but remains amorphous, if heated beyond the point of melting, It does not appear to be volatile, although it may be distilled over, a circumstance referable to its adhesion to the sides of the retort.

Heated in the air it emits an aromatic odour, similar to narcotine, which it resembles in combustion, with a vivid flame and deposition of carbon. Opianic acid expels carbonic acid, and forms, with bases, soluble salts. The salts of silver and oxide of lead crystallize in thin shining prisms and flakes. It contains no nitrogen.

On its composition, formation from narcotine, and remarkable affinity for ammonia, the Editor will at a future period more fully enlarge.—*Journ. für prakt. Chemie*, xxvii., pp. 97, 98.

ON THE CONVERSION OF OIL OF VALERIAN INTO BORNEO CAMPHOR AND LAUREL-CAMPHOR.

BY GERHARDT.

The oil of valerian has been proved to consist of at least two oils; the less volatile oil (called *Valerol*)=is $C_{10} H_{10} O_2$ has not, when pure, the unpleasant odour of valerian, but by exposure to the air is converted into valeric acid, and crystallizes in colourless diaphanous prisms, which may be preserved at a common temperature, if excluded from the atmospheric air. Potash very readily converts it into valeric acid with an evolution of hydrogen; treated with a mineral acid, the valeric acid is set at liberty with an evolution of carbonic acid. Hence it is probable, that valeric acid is not a product of vegetation, but a secondary formation, resulting from the action of the air

on the volatile oil of the plant. This light oil of valerian, like all volatile oils containing oxygen, is in the oil obtained from the valerian root, accompanied by a combination of carbon and hydrogen, in the form of oil of turpentine, with which its chemical characters accord.

This combination of carbon and hydrogen, if exposed to moisture, or distilled with a solution of potash, readily acquires the elements of two atoms of water, and is converted into a crystalline camphor, which has all the properties of Borneo-camphor (from *Dryobalanops Camphora*), as its composition also coincides with that of the latter, as given by Pelouze, viz., $C_{20}\ H_{18}\ O_2$. Gerhardt gives to this compound of carbon and hydrogen in valeric acid the name of *Borneen*, which he believes to be identical with liquid camphor, and to the camphor itself the name of *Borneol*, which he proves to be identical with the camphor of Pelouze, by its conversion, with the acid of nitric acid, into laurel-camphor (*Laurus Camphora*) with this composition, $C_{20}\ H_{16}\ O_2$. Re-agents also produce similar results. If Borneen be heated with strong nitric acid, then saturated with carbonate of soda and distilled, laurel-camphor immediately results.—*Comptes Rendus*, 1842. *Pr. Sem. p.* 832.

OBSERVATIONS ON THE THERAPEUTIC AGENCY OF THE LIQUOR OF HYDRIODATE OF ARSENIC AND MERCURY.

BY PROFESSOR DONOVAN, OF DUBLIN.

[Abridged from the Dublin Journal of Medical Science for November, 1842.]

(*Continued from page* 471.)

CONCLUDING OBSERVATIONS.

It may be collected that the elements of which the liquor of hydriodate of arsenic and mercury is composed, do really acquire an increase of efficacy by combination; for we find, that diseases in which arsenic, mercury, and iodine had been separately tried without any good effect, were finally cured by the same agents when they were in a state of chemical union. Amongst the changes of properties induced on these substances by chemical affinity, an increase of medical efficacy seems to be one.

Thus, in Professor Williams's case, Fowler's arsenical liquor had been given for a fortnight without the least effect; and hydriodate of potash had no better success. But after one week's use of liquor of hydriodate of arsenic and mercury, in very small doses, the lepra began to yield, and soon after disappeared.

In Dr. Osbrey's case of psoriasis, the patient had been for two years under trial of various remedies without relief. When placed under Dr. Osbrey's care, Fowler's solution, mercury, hydriodate of potash, sarsaparilla, guaiacum, and soda, were used without making the slightest impression. Within ten days after the patient commenced taking the liquor of hydriodate of arsenic and mercury, the eruption began to decline rapidly; and in two months the woman was perfectly well.

In Dr. Charles O'Reilly's cases, Fowler's arsenical solution, iodine, calomel, corrosive sublimate, sarsaparilla, and the whole tribe of alteratives had been ineffectually employed; yet the liquor of hydriodate of arsenic and mercury succeeded; in one instance three drachms were sufficient, equal to three-eighths of a grain of arsenious acid; in the other four drachms.

Dr. Bigger's patient had used mercury largely, as also Fowler's solution, without the slightest benefit; but under the use of the liquor he speedily got well. Dr. Irvine frequently failed with iodine, arsenic, and mercury, separately employed, but with the combination he succeeded.

There is abundant evidence that this medicine succeeds in the worst forms of disease, and sometimes in a very short period, when all the usual modes of cure had failed. Dr. Ferguson's patient had been for nearly two years under treatment, but unsuccessfully; yet in two months, the liquor of hydriodate of arsenic and mercury succeeded, when no more than two and a half grains of arsenious acid had been administered. Dr. Hamilton's patient had been under treatment for eight years, without any apparent benefit; but when put on the use of the liquor, she recovered in a few months. Dr. White's patient, for years under the use of various remedies for an excruciating psoriasis, was cured by the liquor in seven weeks. On Mr. Jones's case nearly the same observation may be made. Dr. Hickson's patient had laboured under a disease for ten years, which was cured in less than three weeks by the liquor. Dr. Graves's patient suffered, from what he denominates superficial lupus, for four years, and had been treated in various hospitals with the usual remedies, both internal and external, and with sulphur baths—but all failed. The liquor of hydriodate of arsenic and mercury cured him within seven weeks, when he had taken but two and a half grains of arsenious acid. Dr. Kirby's case of pityriasis had been treated by various practitioners, and resisted every variety of treatment, general and local; after six months' perseverance in the use of the liquor, the disease gave way. The child treated by Sir Henry Marsh for tinea capitis had resisted various remedies during several months, but recovered perfectly under a three months' course of the liquor used internally and externally. Some of Mr. Stokes's patients had also resisted various modes of treatment.

The power of this medicine over lupus is evinced by the cases of Mr. Carmichael, Mr. O'Ferrall, Mr. Jones, and Dr. White. In Mr. O'Ferrall's case, local means were also necessary. Dr. White found the liquor itself adequate as a local application.

That the external application of this medicine, in the form of lotion, is useful, there is sufficient evidence; and this is a property of importance to those whose irritability of stomach and bowels will not permit its internal exhibition. The case of Dr. Croker clearly proves its power as an external agent. The same seems to be evinced by Sir Henry Marsh's second case, in which perseverance in small doses during thirty-nine days did no service, although when the internal use of it was assisted by the external application, the patient speedily began to get well. Mr. Jones's and Dr. Hickson's cases seem also to have received benefit from the local application. I have known several instances in which the external use of the liquor alone was successful, but they were slight affections.

From the various statements it appears, that slight ptyalism sometimes supervenes on the use of the liquor of hydriodate of arsenic and mercury. This might be expected, inasmuch as each of the three elements of which it is composed, is separately capable of producing this result. Arsenic is not so generally known to possess this power; but that it does was proved by Girtanner of Gottingen, who exhibited arsenious acid largely in syphilis. More lately the fact has been again observed. That iodine possesses the same power is now almost as well known as that mercury does. I have observed, however, that when the liquor of hydriodate of arsenic and mercury produces ptyalism, it does so with less previous soreness of the gums than any other mercurial preparation, and often with none.

Mr. O'Ferrall found the effects of this medicine to be coincident with its mercurial action on the gums. Mr. Cusack observed the mouth to become tender in two instances only. And more generally a cure has been effected without soreness of the gums, or ptyalism, as appears by the silence on this symptom, of those practitioners who have furnished the preceding reports.

The dose has been variously represented. Dr. Kirby is disinclined to doses exceeding twenty minims, and this quantity he conceives sufficient to

secure its curative effects. Sir Henry Marsh, in the case of a boy, twelve years old, began with fifteen minims twice a day ; and gradually pushed it to half a drachm ; and at length the patient got half an ounce in divided doses during twenty-four hours, which only produced "very mild in salivation." In venereal eruptions, Mr. Cusack found one or two scruples three times a day sufficient ; but even when larger doses were given, he did not observe any unpleasant consequences. Dr. Irvine's patient took ʒss. three times a day, for seventy-six days, and was only twice obliged to discontinue it for two or three days, owing to headache and sickness of the stomach. Dr. Graves's patient, a woman 60 years old, took ʒss. four times a day for two months, with only two interruptions, owing to disagreement. These instances show how differently the medicine can be endured by different constitutions. It is certainly prudent to begin with Dr. Kirby's doses ; but after a while, as in the case of tartar emetic, a state of tolerance is induced, and then the medicine may be gradually increased at discretion.

The smallness of the quantity of arsenic and of the other elements, that sometimes effects a cure is striking, and affords an additional proof of the energy which they acquire by combining chemically. In one of Dr. O'Reilly's cases, three drachms of the liquor were successful, containing three-eighths of a grain of arsenious acid, three-fourths of a grain of peroxide of mercury, and about two and a half grains of acidified iodine ; in another, one-third more of these elements was required. One of Dr. Ferguson's patients was cured by two and a half grains of arsenious acid. Dr. Osbrey succeeded with about a grain of arsenious acid, Dr. Graves with two and a-half grains, and Sir Henry Marsh, in an obstinate case of tinea capitis, with a quarter of a grain. Cases, however, occasionally prove of a very obstinate and tedious nature ; and, generally speaking, skin diseases offer lengthened resistance to curative measures; thus Dr. Irvine's patient was under treatment seventy-six days, and required seven ounces of the liquor, equivalent to seven grains of arsenious acid ; Dr. Graves's patient, of sixty years old, required ten and a-half grains ; Sir Henry Marsh's, a child of 12 years, required a far greater quantity ; some of Dr. Kirby's patients were a year under cure ; and I know a lady, who being troubled with psoriasis almost all her life, is now after a year's treatment only beginning to improve.

The diseases in which practitioners have hitherto found the liquor of hydriodate of arsenic and mercury to be useful, as appears by the foregoing testimonies, are the various forms of psoriasis, impetigo, porrigo, lepra, venereal eruptions, both papular and scaly, pityriasis, sycosis, ephelis, lupus, sibbens, and some uterine diseases.

Those who have continued to take this medicine during a long period, often lose flesh; but this is by no means a constant effect. In Dr. Croker's second case, the condition of the patient was much improved; and the lady mentioned by Dr. Kirby had become inconveniently corpulent. Dr. White's first patient was left in "excellent health and spirits," and his second was "much improved in general health." Dr. Ferguson reports his first case as having left the hospital in greatly improved, indeed excellent health," and his second as "improved" in general health, In Sir H.Marsh's third case the girl's health was much improved, and she appeared to have acquired considerable increase of flesh."

Sometimes the liquor occasions disturbance of the stomach and bowels. This occurs during the first two or three days of its exhibition; and also when by continuance of its use its effects are accumulated; and then it often affects the head. But these disagreeable results are far from being constant; in none of Mr. Stokes's many cases was there the "slightest derangement of the alimentary canal;" and the same is observable in Dr. Graves's, and several other of the foregoing reports. Future experience, will, perhaps, show, that long continued treatment with small doses

answers better than urging with large ones; the beneficial effects of arsenic are rarely in a direct ratio to the magnitude of the dose.

We have evidence that this medicine may be administered to patients of almost all ages. Thus, one of Sir Henry Marsh's patients was but five years old, while both of Dr. Graves's had attained their sixtieth year, and Dr. Croker's her sixty-eighth.

It cannot be too much impressed on prescribers of this medicine, that they incur great risk of destroying its powers by mixing it with other articles intended to modify its effects. It ought not to be conjoined with opium, nor with acetate, muriate, or sulphate of morphia. When opiates are necessary they should not be administered at the same time with the arsenico-mercurial liquor. In general the best mode of exhibition is simply to prescribe it with *distilled* water. And I take this opportunity of once more suggesting to the profession, that the doses of this medicine should be ascertained by the minim measure, and not by the very variable standard of drops, no two of which are alike.

11, *Clare Street, Dublin.*

THE SALE OF DAMAGED TEA IN PARIS.

On the night of the 12th of November, the "Reliance," an English vessel, was wrecked on the coast of Merlimont, having on board a cargo of 2700 chests of tea, which was advertised for public sale on the 25th instant. M. Dubail, after having examined the quality of the article, addressed a letter to the Faculty of Medicine in Paris, remonstrating against the circulation of a commodity which is frequently employed medicinally, and which had lost its properties by maceration in salt water. He stated, that its appearance was not much altered, but that an infusion made with it possessed none of the aroma, astringent quality, or colour of good tea. The predominant flavour was that of salt, and although the colour and form of the leaves had suffered but little change, it was entirely worthless either as a beverage or a remedial agent. M. Dubail stated, that the quantity was sufficient to supply the French market for twelve or fifteen months, and, therefore, remonstrated against its circulation in the market.

THE SALE OF DRUGS TO BREWERS.

A CORRESPONDENT has written for information respecting the penalties to which Druggists are liable for selling drugs to brewers. In order to give the most explicit answer, and at the same time to enlighten other readers on the subject, we subjoin the section of the Act of Parliament which applies to the case:—

56 GEO. III, c. 58. s. 3.

"And be it further enacted, That from and after the said 5th day of July, 1817, no druggist or druggists, or vendor or vendors, or dealer or dealers in drugs, or chymist or chymists, or other person or persons whatever, shall sell, send, or deliver, or cause, procure, permit, or suffer to be sold, sent, or delivered to any licensed brewer or brewers of, or dealer or dealers in, or retailer or retailers of, beer, knowing him, her, or them to be so licensed, or to be reputed to be so licensed, or shall sell, send, or deliver, or cause or procure to be sold, sent, or delivered, to any other person or persons, for or on account of, or in trust for, or for the use of any such brewer or brewers, dealer or dealers, or retailer or retailers, any liquor called or known by the name or description of, or sold as colouring from whatever materials

the same may have been made, or any other material or preparation other than unground brown malt, for the purpose of darkening the colour of worts or beer, or any liquor or preparation, such as has been heretofore, or shall hereafter, be made use of for or in the darkening of the colour of worts or beer, or any melasses, honey, liquorice, vitriol, quassia, coculus Indiæ, grains of paradise, Guinea pepper or opium, or any extract or preparation of melasses, honey, liquorice, vitriol, quassia, coculus Indiæ, grains of paradise, Guinea pepper, or opium, or any article or preparation to be used in worts or beer, for, or as a substitute for malt or hops respectively; and if any druggist or druggists, or vendor or vendors of, or dealer or dealers in drugs, or any chymist, or any other person or persons whatever, shall sell, send, or deliver, or cause, or procure, or permit, or suffer to be sold, sent, or delivered to any licensed brewer or brewers of, or dealer or dealers in, or retailer or retailers of beer, knowing him, her, or them to be so licensed, or to be reputed to be so licensed, or shall sell, send, or deliver, or cause or procure to be sold, sent, or delivered, to any other person or persons, for, or on account of, or in trust for, or for the use of, any such brewer or brewers, or dealer or dealers, or retailer or retailers of beer, any liquor called or known by the name or description of, or sold as colouring, from whatever materials the same may have been made, or any other material or preparation, other than unground brown malt, for the purpose of darkening the colour of worts or beer, or any liquor or preparation, such as has been heretofore used, or as shall hereafter be made use of, for, or in the darkening the colour of worts or beer, except as aforesaid, or any melasses, honey, liquorice, vitriol, quassia, coculus Indiæ, grains of paradise, Guinea pepper, or any extract or preparation of melasses, honey, liquorice, vitriol, quassia, coculus Indiæ, grains of paradise, Guinea pepper, opium, or any article or preparation to be used in worts or beer, for, or as a substitute for, malt or hops respectively, all such liquor, called or known by the name or description of, or sold as colouring and material, or preparation for the purpose aforesaid, and liquor or preparation used, or which shall hereafter be used, for or in the darkening the colour of worts or beer, melasses, honey, liquorice, vitriol, quassia, coculus Indiæ, grains of paradise, Guinea pepper, extract or preparation of melasses, honey, liquorice, vitriol, quassia, coculus Indiæ, grains of paradise, Guinea pepper, opium, and article or preparation to be used for, or as a substitute for, malt or hops respectively, shall be forfeited, and the same respectively shall and may be seized by any officer or officers of excise, and the druggist or druggists, vendor or vendors of, or dealer or dealers in, drugs, or chymist or chymists, or other person or persons whatever, so offending, shall, for each and every such offence, forfeit and lose the sum of £500."

REVIEW.

ELEMENTS OF MATERIA MEDICA AND THERAPEUTICS. By ANTHONY TODD THOMSON, M.D., F.L.S., *Professor of Materia Medica at the University College, London. Third edition, enlarged and improved.*

THE former editions of this work are so well known to the profession, that it is scarcely necessary for us to analyse it in detail. The author states, that he "has adopted that arrangement of his subject which he thinks the best calculated to make the work useful, both to the student and the junior practitioner." The vari-

ous substances used in medicine are classified according to their therapeutical effects, under the several heads of *Vital Agents*, *Chemical Agents*, and *Mechanical Agents*. This arrangement, it will be seen, differs materially from that which Dr. Thomson has adopted in his lectures, in which his classification relates more to the physical characters of the substances. For instance, in the lectures, the plants are arranged according to the natural system, and their component parts are classified as *roots*, *barks*, *seeds*, &c. &c., while in the work the same substances are treated of, in reference to their qualities, as *purgatives*, *sedatives*, *diuretics*, &c. &c.; and hence those articles which have more than one kind of action on the animal economy are noticed under each of these heads. Although the classification adopted in the lectures is more appropriate for the Pharmaceutical Chemist, there is obviously an advantage in studying the subject under every aspect, and thus obtaining a more complete acquaintance with the comparative power and efficacy of the various medicinal agents. The present edition of Dr. Thomson's work is considerably enlarged, and it is illustrated with a great number of wood-cuts, many of which are particularly well executed.

SCIENTIFIC SOCIETIES.

ROYAL INSTITUTION.

The first Friday evening meeting for the season took place on the 20th of January, and the attendance was extremely numerous in consequence of the announcement that Professor Faraday was to open the session with a communication on the subject of his recent researches on Electrical Phenomena. The anticipations of the audience were more than realized, as the professor was particularly felicitous in all his experiments and illustrations, and treated the subject in a manner which could not fail to interest and instruct every one present.

LONDON INSTITUTION.

January 18, 1843.

CONNEXION BETWEEN THERMOGRAPHY AND VOLTAIC ELECTRICITY—CONTACT THEORY OF ELECTRICITY.

At the *soirée* held at this Institution on Wednesday last, Professor Grove gave a Lecture on some discoveries in Physical Science during the last year. In the course of the lecture he stated, that he had himself made out the following facts with regard to metallic thermographs: 1st, When two portions of the same metal are juxtaposed at the same temperature, little

or no effect is produced. 2d, When with the same metals, at different temperatures, a slight effect is perceptible. 3dly, When the metals are different, at the same apparent temperature, a greater effect is perceptible; and, 4thly, When the metals are different, and at different temperatures, a still greater effect is visible. Again, taking for example, a sovereign placed on a silver or copper-plate, the effect is increased, if the coin be breathed on before being brought into contact; it is still more increased if the coin be rubbed with oil, and wiped apparently dry; and it is still increased, if it be held for an instant over the vapour of a substance capable of chemically acting on the juxtaposed plate; as, for instance, over ammonia, before being placed on copper.

These facts led him to believe that such impressions were caused by a radiation between the metals and unequal condensation of intermediate vapours (produced in the case of different metals, by their differently conducting and radiating powers) the impressions according with the unequal distance of the different parts of the stamp on the coin. In fact, the phenomenon was in some degree analogous to dew. Whatever the nature of the radiation may be, there is unquestionably some radiation; and this fact of inter-radiation was beautifully applied by Professor Grove, to explain a fundamental experiment in voltaic electricity, hitherto a subject of much controversy, viz., the effects of Volta's original experiment on the contact and severance of two discs of dissimilar metals. The contact theory of electricity attributes the effects on the electroscope, produced by this instrument, to simple contact. The antagonist theory asserts, that no electrical disturbance can take place without some chemical or physical change. Now, as the facts of thermography prove a radiation of some sort (for this argument, no matter of what sort) to take place, on the juxta-position of different metals, a physical change is produced, electricity ought to be developed on their separation, caused either by their action on each other, or by the different degrees of evaporation from each of their surfaces when separated, or by the chemical action of the condensed vapour This physical change ought to produce and does produce a disturbance of electrical equilibrium; and thus recourse to the incomprehensible action of simple contact is unnecessary. An experiment was shown strongly confirmatory of this view (if indeed it need corroboration), the discs of zinc and copper were juxtaposed, surface to surface, but contact prevented by a rim of paper, and yet when separated the electroscope was affected; here, then, was *no contact*, and yet the electrical effects were produced which should be so by the mutual radiation, but which should *not* be so by the contact theory.

TO CORRESPONDENTS.

Mr. S., of S.—Phosphate of lime and magnesia are soluble, without effervescence, in hydrochloric acid; caustic ammonia precipitates them from this solution. If to the hydrochloric solution, rendered as neutral as possible, oxalate of ammonia be added, the lime is precipitated in a state of oxalate; the supernatant liquor being evaporated to dryness, the residue, after ignition, consists of phosphate of magnesia. Another mode of proceeding is as follows: Dissolve the phosphate of lime and magnesia in nitric acid, and to the nitric solution add nitrate of lead: a white precipitate of phosphate of lead is obtained, which fuses before the blowpipe, and crystallizes on cooling. The excess of lead in the supernatant liquor may be removed by sulphuretted hydrogen, and to the boiled and filtered liquor carbonate of soda afterwards added, by which the lime and magnesia are precipitated. Berzelius states that phosphate of magnesia is soluble in cold water, and as phosphate of lime is insoluble in that menstruum, it is probable that the two substances might be separated by this means. Hot water is inadmissible, as it alters the constitution of the salt.

T. I.—Mr. Woolley, of Regent Street, Westminster, a Member of the Pharmaceutical Society, is a manufacturer of hydrometers and saccharometers. A case of these instruments may be seen by our correspondent on application to the Curator at the house of the Society.

"An Enquirer" must not assume, that sulphuric acid has necessarily a stronger affinity for oxide of iron than gallic acid. The mineral acids are frequently displaced from their combinations with metallic oxides by gallic acid, and also by some other organic acids. In the preparation of writing ink, however, it is not a gallate merely, but a tanno-gallate of iron that is formed.

Benzoic acid, as obtained from benzoin by sublimation, is generally, if not always, contaminated with a portion of empyreumatic oil, to which it owes its peculiar smell. If required in a state of great purity, a benzoate of soda or potash may be formed by boiling the benzoic acid of commerce with the carbonates of these alkalies, and, on adding hydrochloric acid, pure benzoic acid will be precipitated.—The answer to the question respecting labels will be found among our advertisements.

R. S. Y. (A Chemist).—The following proportions answer well in preparing writing ink:

Galls, ℥iij.
Sulphate of iron, ℥j
Gum, ℥iss.
Water, ℥xxxij.

"A Member" (at Pershore), is desirous of obtaining, through some correspondent, a recipe for making waterproof varnish for boots.

⊙ H. G., A.P.S.—1st. The use of soda, in the cases alluded to, is intended for the neutralization of *excess of* acid. Although hydrochloric acid be a constituent of the gastric juice, it does not follow that an excess of this acid, or the presence of other acids, should tend to promote digestion. 2d. For an account of the composition and process for the preparation of the heavy carbonate of magnesia, see Pereira's "Elements of Materia Medica," 2d edition, page 605. We believe the process there given is that followed at Apothecaries' Hall. It is obtained by mixing saturated solutions of sulphate of magnesia and carbonate of soda and boiling. 3d. The subscriptions of Members and Associates of the Pharmaceutical Society must be paid before the end of March. We cannot answer the fourth question at present.

M. P. S. (Stockport), desires "an accurate process for separating the oleine and stearine from vegetable and animal fats." Oils and fats generally consist of stearine, margarine, and oleine. The two last are more soluble in cold ether, and may be thus separated from the stearine. The etherial solution being evaporated to drive off the ether, the residue is to be dissolved in boiling alcohol, and from this solution, as it cools, the margarine will be deposited.

If "An Associate who hates Sophistication," will append his name, his communication shall be inserted.

Mr. Keen.—In making the Extract of Colocynth, the seeds should be rejected, as the pulp is the officinal part of the plant.

We recommend L. G. to adhere strictly to the instructions of the Pharmacopœia in making tinctura opii, as uniformity in this preparation is of great importance.

R. S. has sent us a sample of hyd. cum cretâ, in which a small portion of sugar was added during the trituration, which he finds to facilitate the extinction of the mercury.

Mr. Stokes recommends, as a means of distinguishing potash from soda, the addition of nitric acid and the observation of the crystals in the microscope. This process merely detects the presence of the two alkalies, but does not ascertain their proportions. Other means of doing this are known, but like the above, they are not adapted to commercial purposes. The crystals of nitrate of soda are not cubes, but belong to the rhombohedral system, and are commonly obtuse rhombohedrons.

Mr. Lamacraft inquires whether the lime water should be used hot or cold in the following prescription :—

℞ Sarsaparillæ Contusæ, ℥iij.
Aquæ Calcis, f℥xii.

Macera per horas xii et cola.

℞ Colaturæ, f℥xi.
Syrupi Sarsaparillæ, f℥ss.
Liquoris Potassæ, f℥i.
Iodidi Potassii, gr.xii.
Tincturæ Aurantii, f℥iij. M.

It is evident that the lime water should be used cold, as lime is more soluble in cold than in hot water, and heat is not necessary for the solution of the extractive matter of the bruised sarsaparilla. It is important to exclude air during the maceration, to prevent the absorption of carbonic acid by the lime, and the consequent deposition of the carbonate.

The sample of scammony has not the smell, taste, or appearance of good scammony.

R. W. suggests the propriety of forming a Latin Class for Apprentices and Associates to meet once a week. This might be easily arranged if those who feel disposed to join such a class would communicate with the Editor or the Secretary.

Juniper fruit ought to be bruised in making the decoction.

Liquorice root may be kept in damp sand.

C. B. M. (Brighton).—Dr. Pereira's "Materia Medica" is the most "complete and explicit work" on the subject.

X. Y. Z.—Tinctura iridis is made by macerating bruised or sliced orris-root in rectified spirit. The proportions are of no consequence, as it is only used as a perfume. The *esprit de violettes* is prepared by macerating one part of powdered orris-root in eight parts of spirit for fifteen days. The essence of millefleurs is imported from Paris, and is sold by the dealers in French perfumery.

J. M. L., M.P.S.—Opinions differ as to the precise time which is requisite for extracting the properties of the ingredients in making tinctures, which accounts for the discrepancy in this particular between the London and Dublin Pharmacopœias. It is decidedly improper to allow the tincture to remain six or twelve months on the dregs. In order to produce a result uniformly bright and efficacious, the tincture should be strained at the time appointed.

Directions for the process of displacement, with descriptions of the apparatus, are contained in vol. i, pages 61, 591, and 654.

The paper on Leeches by Mr. Baynes was in type before the letter of J.M.L. was received.

"M. R. C. S. ON SHORE."—The essence or extract of malt is prepared by Mr. Hudson, 27, Haymarket.

"A MEMBER" (Abingdon).—We have frequently recommended Lindley's "Elements of Botany," and also Lindley's "Natural System and Medical Botany."

"AMATOR JUSTICIÆ" thinks the lectures, delivered at Bloomsbury Square, should be published in the Journal for the benefit of those who cannot attend. —We generally insert one lecture in each number, selecting such as contain information, either new, or not to be met with in elementary works. The courses of lectures would occupy so much space as to leave no room for other matter. We endeavour in our selection of materials to give the most practical and appropriate information; the present number contains several articles which are inserted in consequence of questions received by post from correspondents, and we would ask, whether the object of the work is not more fully attained by this means than it would be by the insertion of ELEMENTARY LECTURES?

"THREE ASSOCIATES" should send their names and address.

"A DRUGGIST'S ASSISTANT" mentions a case of illiberal conduct on the part of a medical man, in sending medicine to a Druggist, whom he was attending, and charging more than the usual amount for attendance. However such circumstances are to be regretted, the subject is one which we could not with propriety discuss.

T. S.—The Benevolent Fund has not yet come into operation.

A MEMBER (Bath).—Iodide of iron is not adapted for administration in the form of pills, on account of its liability to decomposition, as well as for other reasons of a medical nature.

Mr. JOHN ELLIS (Dewsbury). An answer was sent by post, but it came back as a "Returned letter."

QUICKSILVER, and J.B.Y.—COCHLEAR, COCHLEARE, or COCHLEAREUM, means literally a SPOONFUL; we believe it is generally understood by the Profession to denote a TABLE-SPOONFUL, whether the word MAGNUM be added or not. We are borne out in this view by Dr. Philipp Phœbus, in his *Handbuch der Arzneiverordnungslehre*, 3d edit., p. 98. It is usual, however, for the sake of perspicuity, to call a table-spoonful *cochleare magnum*; a dessert-spoonful, *cochleare medium*; and a tea-spoonful, *cochleare minimum*. In the same manner, CYATHUS is literally a DRINKING CUP, but is generally understood to denote a wine glass. Sometimes, but not always, the word VINARIUS is added. *Cyathus magnus* is a *tumbler*, and *poculum*, which literally means a cup, is generally understood to mean a *tea-cup*.

OMEGA. — We never heard of any law restricting the dimensions of stills used for Pharmaceutical purposes. Omega gives a case illustrating the want of education among Chemists and Druggists.

M. M. (Southampton).—See PHARMACEUTICAL JOURNAL, vol. i., page 268.

"A Druggist" (Newcastle).—The College of Surgeons does not possess an Act similar to that of the Apothecaries; but by 3 Henry VIII. c. 2, no one can practise as a Surgeon in London, or within seven miles, without a licence from the College of Surgeons, under a penalty of £5 per month.

But a person, not so licensed may sue for business done even within these limits, the statute containing no prohibitory clause.

Out of the limits, there is no restriction whatever; within the limits, the above mentioned penalty only, and no authority is given to the College of Surgeons to sue for these penalties. As, however, it is open to any person to inform, and upon conviction take half the penalty, it is open to the College of Surgeons to set any one in motion.

J. Cave.—Associates who have passed the examination, are entitled to the certificate of qualification.

F. R. being already an Associate, is exempted from examination.

An Apprentice (London).—The decimals being included, the sum total is 100. The answer to the other question is postponed until next month, as well as the answer to "Conquisitor."

Θ.—The so-called ginger-root is a rhizome, or under-ground stem, and like all other organs in which farina or fecula is found, contains, at different periods of its growth, &c. unequal quantities of starch. The potato is a familiar illustration, some specimens being very farinaceous, others waxy.

M. P. S. (Bromley).—The usual mode of preparing *fel bovini* is to inspissate it at a moderate temperature.

(?) A.P.S., wishes to know, "if any elastic varnish would answer the purpose of covering wire for galvanic purposes?" and inquires, What work is the best on experimental galvanism?—We have heard that an Indian rubber varnish has been used, but it is rather apt to peel off. Professor Daniell's forthcoming second edition of his *Chemical Philosophy* will contain the best and most recent information on Galvanism.

T. B. adverts to a quotation of Mr. Semple, respecting the quantity of laudanum taken in a day by a literary character. The quotation is copied *verbatim* from Dr. Christison's work on Poisons (1835) page 662.

"A Member of the P. S."—The subject is under the consideration of the Council.

A. B. (Coventry), should write to the Secretary, and sign his name. It would be useless to direct his Journal to "A. B., Coventry."

In vol. ii, No. 6 (Notice to Correspondents, on the cover) a typographical error occurred, **1841** being printed, instead of **1842**. This was obviously a misprint, but it appears to have occasioned alarm in the minds of some of our readers, which we regret.

We are obliged to postpone the insertion of several articles for want of space, although our present number is one-third larger than usual.

Advertisements to be addressed to Mr. Churchill, Princes Street, Soho.

Other Communications to The Editor, 338, Oxford Street (before the 20th of the month, if answers be desired in the ensuing number).

PHARMACEUTICAL JOURNAL.

VOL. II.—No. IX.—MARCH 1st, 1843.

ON COMPETITION IN THE DRUG TRADE.

One of the most difficult and intricate subjects which it comes within our province to discuss, is the regulation of the prices of drugs, and the remuneration for labour in their preparation. This is not merely a mercantile question; it affects the credit of our profession no less than it does the pecuniary interests of our members, for while it may be considered an axiom, that a certain amount of competition is essential to the good of the public, it is no less true, that a business which does not realize a living profit, cannot be respectably conducted.

Those who patronize cheap shops in purchasing the ordinary necessaries of life, such as food, clothing, furniture, &c., have no reason to complain if the flavour of one commodity, or the durability of another, should be found defective; and on these points the public is enabled to form an opinion from experience with some degree of accuracy, and thus to decide respecting the policy of purchasing articles for less than their apparent value. In the case of medicine, however, the decision is much more difficult. The purity of many articles cannot be estimated by their obvious or sensible qualities; the use of chemical tests is not understood at all by the public, and imperfectly even by the profession; nor is the apparent effect of a remedy in any particular case an infallible criterion of its worth. A good medicine, injudiciously administered, may produce an unfavourable result; and, on the other hand, a patient may obtain relief, or recover by an effort of nature, after taking what was almost, if not entirely, inert.

Another difficulty which exists in determining the actual value

of each particular medicine, proceeds from the price being, in many cases, affected more by the amount of labour required in its preparation than by its original cost; which occasions a confusion in the calculation between the items of *labour* and *profit*.

According to Adam Smith, "the price of a thing, in most cases, consists of three distinct elements—the wages of the labour, the profit of the master who directs the labour, and the rent of the ground," &c. He proceeds to state that, "if the one species of labour should be more severe than the other, some allowance will naturally be made for this superior hardship: and the produce of one hour's labour in the one way, may frequently exchange for that of two hours' labour in the other; or if the one species of labour requires an uncommon degree of dexterity and ingenuity, the esteem which men have for such talents will naturally give a value to their produce, superior to what would be due to the time employed about it. Such talents can seldom be acquired, but in consequence of long application, and the superior value of their produce may frequently be no more than a reasonable compensation for the time and labour which must be spent in acquiring them."*

These observations are applicable in an especial manner to pharmaceutical preparations, which are the result of processes more or less tedious and laborious, and which, from the difficulty of estimating their efficiency by their appearance, and other obvious properties, often derive their value from the reputation of the maker, or, in other words, from the estimated value of his time and labour. Thus the sulphate of quinine of one manufacturer may produce in the market ten per cent. more than that of another, and probably fifteen per cent. more than the same article prepared by a person whose name is unknown. In the case of some delicate preparations, as, for instance, morphia, strychnia, aconitina, &c. the variation in the market value may be much greater; while in other articles requiring less talent and experience in their production, or possessing physical characters more readily distinguished, the variation in value is com-

* "Wealth of Nations," vol. i. page 63. 1811.

paratively trifling. In all cases, however, the price at which an article is sold should be sufficient to pay the natural rates of wages, profit, and rent. This is what Adam Smith calls its "natural price;" and he states, that "the commodity is then sold precisely for what it is worth, or for what it really costs the person who brings it to market: for though, in common language, what is called the prime cost of any commodity does not comprehend the profit of the person who is to sell it again; yet if he sells it at a price which does not allow him the ordinary rate of profit in his neighbourhood, he is evidently a loser by the trade; since, by employing his stock in some other way, he might have made that profit. His profit besides is his revenue, the proper fund of his subsistence."*

When the amount received by the manufacturer exceeds that which is here termed the *natural price* of his goods, the circumstance may be supposed to arise from one of two causes; either that the supply of the article in the market being inadequate to meet the demand, some purchasers are willing to give more than the ordinary value, or that the skill and reputation of the manufacturer enables him to obtain a higher rate of remuneration for his time and labour. The sale of commodities below their *natural price*, may proceed from excess of competition, a temporary glut in the market, want of confidence in the vendor, or an erroneous method of calculating the cost.

The first of these extremes, namely, the sale of commodities above the natural price, is generally kept within due bounds by the influence of competition, for although the public will readily pay for fashion and prejudice to a certain extent, a re-action almost invariably takes place when the rate of charge is found to approach to what is termed, in common language, "an imposition." In the case of a monopoly, where an individual or a company of individuals obtains the entire control over a commodity, the interest of the public must inevitably suffer. For instance, if one person buys up all the mercury which the mines

* "Wealth of Nations," vol. i. page 74. 1811.

produce, "the trade" has no alternative but to pay whatever he demands, and to charge in proportion. Again, the inventor of any particular process retains absolute control over the rate of profit which he demands, so long as the article in question is in request, and the method of preparing it is known only to himself. These cases of monopoly are comparatively rare, and are generally limited in their duration.

The sale of articles below the natural price is much more common, and although this might, at first sight, appear to be a public advantage, the indirect tendency of the practice is no less injurious than the opposite extreme. The primary effect of competition is a reduction of prices, as every merchant or vendor of a commodity finds it necessary to reduce his profits to meet the state of the market, and when there are many persons anxious to sell, each endeavours to secure to himself a preference by offering the greatest possible advantage to his customers. So long as this is done without violating the correct principles of fair remuneration, the public derive benefit from the competition. But it often happens, that in individual transactions general principles are overlooked, and the causes which lead to this result require to be considered more in detail. It is obvious that the inducement to embark in any particular line of business is in proportion to the existing demand for the commodity in question, and that so long as this demand continues to increase, the number of aspirants to a share of the profits increases likewise. Nor does competition stop at this point, as the success of one man in any department, frequently induces a hundred to follow in his wake, each hoping to derive the same benefit. A re-action is the inevitable consequence. The market is overstocked, and the profit being divided among a larger number of persons than it is calculated to support, a variety of expedients are resorted to by each individual for the purpose of gaining an advantage over the rest. A prominent feature in this struggle is a reduction in prices, and this is often carried to an extent which involves the parties in heavy loss or absolute ruin. Many sacrifices are made by merchants, in cases of emergency, when a

disappointment in the sale of goods places their credit in jeopardy, and pressing demands for ready money oblige them to sell at any price which happens to be offered. These occurrences impair the stability of the market; purchasers take advantage of the necessities of vendors, who follow the example of each other until the calculations of profit on the principles of fair remuneration are forgotten in the eagerness to do business on any terms. Sometimes the competition between two or three individuals is carried to such an extent, that the ultimate result is dependent on the length of their respective purses; those who have the smallest capital being ruined, while the successful competitor finds himself, with reduced capital, master of a trade which no longer affords a living profit.

Another very serious result of excessive competition is a deterioration in the quality of commodities. When the market price of a genuine article is reduced so low as not to afford a living profit, the vendor or manufacturer is driven to an extremity which induces him to resort to a variety of expedients for remunerating himself. The first and most natural consequence of this state of things, is, that less care is bestowed on the manufacture or purification of the article, and any part of the process which involves expense, and which can by possibility be dispensed with, is discarded. The object in view is the amount, more than the quality, of the product, which, even if genuine, is no longer so fine as it ought to be. In the case of simple drugs in which everything depends upon the selection, or the separation of the various qualities, this is in a great measure neglected when a remunerating price cannot be obtained.

But it often happens that even this amount of economy or negligence is found ineffectual in securing an adequate profit, and the next step is a systematic adulteration, or the substitution of one article for another. It is needless to enumerate instances in which this practice is resorted to; the facts of the case are unfortunately too well authenticated, and since the main object and inducement for carrying on business is profit, it is not unfair to doubt the honesty of a transaction in which the vendor, if

honest, must obviously sustain loss to any considerable extent. It may happen, it is true, that the market is overstocked with some particular article, and that all who hold it in any quantity being in the same predicament, are obliged to meet the emergency by making a sacrifice; but in ordinary cases when a product, such as an essential oil, or a medicinal preparation, is offered at a price very much below the cost at which it can be imported or produced, we may suspect that it is either sophisticated or of inferior quality.

As a result of excessive competition in the drug trade, we may notice the *ad captandum price lists* which are occasionally circulated, in which the prices quoted are tempting only to those who are ignorant of the real value of the articles. And here we allude, not to those lists in which drugs of the first, second, and third quality are described with their respective prices, but to those which contain but one price attached to each article, and that price quite disproportionate with its market value, if genuine and sound. It is obvious that great injury is done to the wholesale trade by those who issue such lists; as the inevitable result is that the retailer is led to form erroneous ideas on the subject, and is therefore with difficulty persuaded to give a fair price for his stock.

It is, therefore, evident, that although a certain amount of competition is beneficial to the public, by acting as a check upon monopoly and extortion, yet when carried to this extent it becomes a public evil, by deteriorating the quality of commodities; and while the consumer suffers this inconvenience as the inevitable result of unnaturally low prices, the members of the trade gain nothing by "cutting each other's throats." In the case of articles of luxury, a reduction of price often increases consumption to such an extent as to compensate by the amount of business for the diminution of profit on each transaction; but this cannot be said to apply in the same degree to the traffic in drugs, as few persons would take a double dose of medicine because it happened to be reduced to half the price.

TRANSACTIONS

OF

THE PHARMACEUTICAL SOCIETY.

LECTURE

ON THE METHOD OF DETERMINING THE PURITY, STRENGTH AND VALUE OF

SEVERAL PHARMACEUTICAL PREPARATIONS.

BY GEO. FOWNES, PH. D.
Lecturer on Chemistry at Charing Cross Hospital.

I PROPOSE this evening addressing you on a subject of a purely practical nature, which, although not admitting of any very brilliant experimental illustration, will yet, I venture to hope, interest you by its own intrinsic importance in every point of view.

It is obvious, that unless the exertions of the physician are diligently seconded by those of the individual to whom is intrusted the no less important task of practically carrying out his intentions, the latter must be continually frustrated, and the recovery of the patient greatly impeded, even when no positively dangerous consequences arise from carelessness or incapacity on the part of the dispenser. It is the object of the present lecture to lay before the Members of the Society an outline of a few of the methods of testing or assaying the strength and purity of certain preparations of extensive use in Pharmacy and the arts, which are constantly had recourse to by the scientific Chemist, and which processes are for the most part so simple and easy of execution, as to admit of very extensive application at the hands of all engaged, either in the preparation or the employment of such substances.

At my request, a list of the articles most proper to be discussed this evening has been prepared, and from it I have made a selection of a certain number, so chosen, that the methods of examination may serve as models or types for all enquiries of a like nature. When once we are in possession of a general principle to serve as a guide, we feel comparatively little difficulty in modifying its application to suit each particular case.

It is convenient to begin with the three mineral acids. Many of the remarks about to be made apply equally well to various organic acids, which sometimes require examination.

Sulphuric Acid.—There will be no need to describe in detail the mode of preparation and most striking properties of this great article of national manufacture: I need only remind those who have been in the habit of attending our morning lectures, of the very curious nature of the change by which *sulphurous* acid, produced by the direct combustion of sulphur, acquires an additional dose of oxygen from the atmospheric air with which it is mingled in the leaden chamber, thereby passing into *sulphuric* acid, which at once unites with the steam of water also present, generating vapour of oil of vitriol, which is at once absorbed by the stratum of water upon the floor; the agent which brings about this change being one of the lower oxides of nitrogen, which becomes alternately oxidized by the air and reduced by the sulphurous acid, thus acting as a kind of carrier of oxygen from the one gaseous substance to the other. You are familiar, also, with the means employed for concentrating this dilute acid solution so produced, namely, simple evaporation, and bringing it into the state in which we find it in commerce.

Liquid sulphuric acid, or oil of vitriol, when pure and in its most highly concentrated form, is a very dense, oily, inodorous liquid, colourless and transparent, of intensely sour taste, and acid reaction—two properties retained even when largely diluted. It chars and destroys many kinds of organic matter, and when mixed with water evolves so much heat as to render its dilution, when large quantities are concerned, a dangerous operation, unless certain precautions are attended to. The specific gravity of the strongest acid is about 1.85 at 60° and in this condition it contains water and real acid chemically combined in the proportion of their equivalents: this water exists in the state of a base, and cannot be expelled by heat, the liquid acid distilling over unchanged if the temperature be sufficiently high.

The oil of vitriol of commerce has usually a somewhat lower density than that mentioned, from defective concentration in the platinum vessel, and on dilution generally becomes more or less turbid from the separation of a little sulphate of lead derived from the leaden pan used for evaporating the weak acid. This salt, although nearly insoluble in water, dissolves in notable quantity in the strong acid, and separates when the latter is diluted. This impurity is in most cases unimportant. Sulphate of potash is now and then found in oil of vitriol, and may be detected by boiling down to dryness a portion of the acid in a platinum capsule in the open air, or under a chimney, and examining the

solid residue. It is difficult to see how any notable quantity of this or any such substance can find its way into the acid by fair means. Either nitric or sulphurous acids may be present, *not both;* the latter is easily detected by its odour, which is also the case with the former on dilution, by the aid of the heat evolved; the acid also bleaches indigo. Nitric acid is a very bad contamination, and unfits the oil of vitriol containing it for a great number of purposes.

Another very dangerous impurity is arsenic, arising from the use recently made of iron pyrites or poor copper ore as a substitute for Sicilian sulphur, in consequence of the increased price of the latter article. These minerals very frequently contain a large amount of arsenic, which becomes transferred to the manufactured acid. So far however as one may venture to form an opinion, this impurity is less likely to be met with in good oil of vitriol made for sale as such, than in some of the products in the preparation of which that substance is largely used; in such cases, a less degree of care is given to the manufacture of the acid, and greater temptation exists to employ for the purpose the cheapest materials.

Arsenic is easily detected: a stream of sulphuretted hydrogen passed for some time through the largely diluted acid precipitates orpiment, which may be collected, washed, dried, and lastly reduced in a small glass tube with black flux. The mere fact of a yellowish or dirty white precipitate being caused by the gas after some time, cannot be taken as a proof of the presence of arsenic, since the same appearance may easily arise from a deposition of sulphur.

It often becomes very desirable, both in scientific research and also in a great number of manufacturing processes, to have it in our power to prepare a dilute solution of sulphuric acid of a certain determinate strength, so that a given measure shall contain a known quantity of real or anhydrous acid. Let us suppose, for example, that we wish to have a dilute acid of such strength, that a measure equal in capacity to 1000 grains of distilled water, shall contain 100 grains of real acid*. We proceed in the following way:—Say we require a gallon, or 70,000 grain measures of the diluted acid:

If the oil of vitriol we start with be tolerably pure and of the

* The grain measure of distilled water is often found a very useful and convenient unit of volume in chemical researches; vessels graduated on this plan, which is easily done by directly weighing into them portions of distilled water at 60°, bear simple comparison with the imperial gallon and pint, besides frequently enabling the operator to measure out a liquid of known density, instead of weighing it.

density 1.85, or very near it, the matter is simple enough:—every 49.1 grains of the liquid acid contain 40.1 grains of absolute acid; the quantity of the latter required in the 70,000 grain measures of dilute acid will be of course 7000 grains; this is equivalent to 8571 grains of the oil of vitriol; for

Real Acid.		Oil of Vitriol.				
40.1	:	49.1	::	7000	:	8571

All that we require to do, therefore, is to weigh out 8571 grains of our oil of vitriol, and dilute it with so much water *that the mixture, when cold, shall measure exactly one gallon.*

Suppose, however, as will certainly happen in the majority of cases, that the oil of vitriol has a density different from that abovementioned, inferior to it, the liquid acid is no longer a compound of single equivalents of real acid and water. Before it can be made use of at all it is necessary to know its exact strength, the proportion of real acid it contains, and this is done by discovering the exact saturating power of a given quantity.

An equivalent of potash or soda combines directly with an equivalent of real sulphuric acid, forming a neutral salt, destitute of action on vegetable colours; if, therefore, we can find out by the aid of test-papers, the exact quantity of either of these bases required to mask the acid re-action of a known weight or measure of the oil of vitriol, a very simple calculation will enable us to determine with precision the per-centage of real acid in the latter.

Pure anhydrous carbonate of soda is prepared by heating to dull redness, without fusion, the bicarbonate of commerce; in this salt, the acid and base exist in the proportion of their equivalents; that is, 53.4 grains contain 31.3 grains soda, or 170.6 grains exactly 100 grains soda. This latter quantity is weighed out, and carefully added, a little at a time, to a known weight, say 100 grains, of the oil of vitriol to be tried, diluted with four or five times its bulk of water, until the liquid becomes perfectly neutral. On weighing the residue of the carbonate it is at once known how much of that substance has been employed, while a simple rule of proportion gives the amount of real acid in the oil of vitriol. Thus, suppose the carbonate of soda used to be 105 grains, then

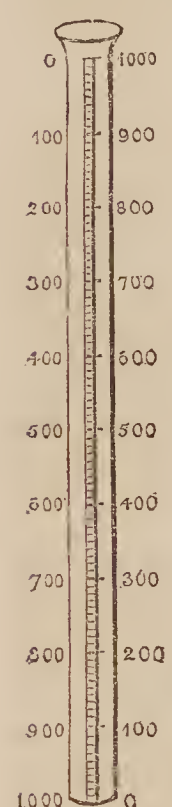
Eq. of Carb. Soda.		Eq. of Sulph. Acid.		Carb. Soda.		Sulph. Acid.
53.4	:	40.1	::	105	:	78.8

78.8 grains of real acid are therefore contained in 100 grains of oil of vitriol; consequently

78.8	:	100	::	7000	:	8883

the weight in grains of the oil of vitriol required to make one gallon of the dilute acid.

The operation of neutralizing the hundred grains of oil of vitriol by carbonate of soda, so as to arrive at the quantity of the latter taken to saturate the acid, may be very well performed by another method; by an instrument, namely, called from its most common application, an "alkalimeter." This is nothing more than a measure carefully graduated to grains' weight of distilled water, easily made out of a piece of glass tube, about .55 inch internal diameter, and 17 inches long, having one extremity sealed, and the other slightly turned outwards or lipped by the aid of the blow-pipe flame. A strip of paper is then pasted on the tube, and suffered to dry, after which the alkalimeter is graduated, by counterpoising it in a nearly upright position in the pan of a balance of moderate delicacy, and weighing into it, in succession, 100, 200, 300, &c. grains of water at 60°, until the whole quantity, 1000 grains, has been introduced, the level of the water in the tube being, after each addition, carefully marked with a pen upon the strip of paper, the tube itself being held quite upright, and the *mark made between the top and bottom of the curve formed by the surface of the water.* After this, the smaller divisions of the scale of 10 grains of water each, may be made, by dividing, with a pair of compasses, each space into ten equal parts, which may be marked by short ink lines upon the paper. When the graduation is complete, and the operator is satisfied respecting its accuracy, the marks may be transferred to the tube itself, by a fine sharp file, after which the paper may be easily removed by a little tepid water. The numbers are scratched on the glass by the hard end of the same file.



Alkalimeter.

To use the instrument for the purpose just mentioned, the 170.6 grains carbonate of soda, carefully weighed out and dissolved in a little water, must be put into the alkalimeter and the remainder of the space up to 0 on the scale supplied by pure water, after which the mouth must be closed by a cork or by the hand, and the contents agitated for a moment to insure uniformity of mixture. Now, it will be quite obvious that in this case every division of the tube will contain one grain of pure soda, and if the alkaline liquid be carefully poured into the acid to be examined, the whole being constantly agitated, and at the same time warmed to dissipate the carbonic acid, the quantity of soda employed in the process of saturation is at once known by mere inspection.

Hydrochloric Acid.—The aqueous solution of hydrochloric acid when free from impurity is quite colourless and transparent,

and leaves no residue on evaporation to dryness. The density of the strongest acid is about 1.2; in this state it fumes strongly in the air; there are very few purposes however for which an acid of this degree of concentration is required.

The hydrochloric acid of commerce is usually contaminated with oxide of iron and organic matter which communicate a deep yellow colour; common salt and sulphate are often present; now and then sulphurous acid is found and recognized by its odour. These impurities (except the last) may be got rid of by diluting the strong acid with about an equal volume of water and re-distilling in a common retort and receiver.

The preparation of a dilute acid of definite strength is conducted on the principles already described in the case of sulphuric acid. A portion of the acid to be diluted is weighed or measured out, and its contents of real acid ascertained by observing the quantity of soda required for its saturation. A simple rule of three having for its two first terms the equivalents of soda and hydrochloric acid, and for the third, the soda actually taken in the experiment will give the information required. When the acid has been diluted, its real strength may be verified by the same means.

Nitric Acid.—When pure, nitric acid leaves no residue on evaporation to dryness; and when freely diluted gives no cloud with solution of barytes or oxide of silver. Its strength may be, to a certain extent, inferred from its density, and exactly ascertained by finding, as before, the quantity of soda required for the saturation of a weighed portion. The calculation is the same as in the preceding cases; the equivalent of nitric acid being substituted for those of the hydrochloric or sulphuric acids in the rule-of-three statement, and by the aid of the knowledge thus obtained, a dilute acid of any wished-for strength may easily be prepared.

In roughly estimating the proportion of real nitric acid in any sample of that substance, a shorter plan may be followed which obviates all calculation. It is founded on the close approximation of the equivalents of nitric acid and anhydrous carbonate of soda, the former being 54.1, and the latter 53.4; so that every grain of dry carbonate of soda used in saturating a given quantity of liquid nitric acid, indicates a grain of real acid in the latter.

Such is the principle of estimating the strength of an acid by ascertaining its capacity of saturation; a principle applicable to many more cases than the three described, and at the same time perfectly easy in practice. By its aid the Druggist may always prepare and examine the diluted acids used in medicine, so as to ensure perfect uniformity, and what is, perhaps, of almost equal

importance to him individually, relieve himself of the burden of having to prepare substances with his own hands according to a specific formula, instead of saving his time and labour by having recourse to the products of the chemical manufacturer, who operates upon a large scale with all the economy experience has suggested to him.

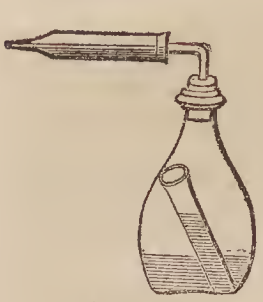
Alkaline Salts—Determination of Alkali in specimens of Caustic, Potash, Soda, Ammonia, and their Carbonates.—The method to be used in all these cases is still that of saturation; only an acid is used in place of an alkali. The most convenient plan for general purposes is to make choice of a diluted sulphuric acid of exactly one grain of real acid in the ten-grain measures of liquid, the preparation of which was purposely described at length at the commencement of the lecture. A convenient quantity of the alkaline salt or solution, say fifty grains, if it be in the solid state, is weighed out and dissolved in water in a porcelain capsule; the alkalimeter is filled to 0 with the test-acid, and with the latter the alkali is carefully neutralized, using a little heat, and employing as usual red and blue litmus-paper. When the solution is quite neutral the quantity of real acid taken is read off, and the corresponding quantity of alkali present in the sample ascertained by the rule of proportion in a manner almost too simple to need detail. For example, a manufacturer wishes to know the quantity per cent. of available soda, that is, soda in the state of carbonate and hydrate, in certain "British alkali," or soda-ash, he has purchased and is about to use. He begins by weighing out fifty grains of the salt, and dissolving it in a little warm water; he next fills his alkalimeter to 0 with test-acid, and with it carefully neutralizes the solution of soda-ash. He observes, that to effect this, thirty-three measures of acid are requisite, indicating of course *thirty-three grains* of real sulphuric acid; hence he makes his calculation,

S. Acid.		Soda.		S. Acid.		Soda.
40.1	:	31.3	::	33	:	25.5

in the fifty grains, or double that quantity in the hundred. When potash or ammonia salts are operated upon, we have only to substitute the equivalents of these bodies in the calculation.

A plan of this kind, not always the same in detail, is constantly employed by glass and soap-makers and others for assaying the different samples of kelp, barilla, soda-ash, &c., which pass through their hands in the course of business.

The direct determination of the carbonic acid in the various alkaline and earthy carbonates, is often highly desirable for the solution of questions constantly arising in practical chemistry; the following general method succeeds most admirably:



Apparatus for carbonic acid experiment.

A light glass flask, with a lipped edge, of the capacity of three or four ounces, is provided and a good cork fitted to it; this cork is perforated to receive a bit of glass tube bent at a right angle, the other extremity of which is secured by a second small cork into a short tube of about three inches long, filled with fragments of dried chloride of calcium, which are prevented from escaping by a little cotton wool at either end. A small tube closed at one end, and of such size as to pass freely into the flask, is also provided. The sketch shows the entire arrangement. From thirty to fifty grains of the carbonate to be examined being carefully weighed out and introduced into the flask with about an ounce of water, the tube represented within is nearly filled with strong acid and carefully placed in the position shewn by a pair of forceps, after which the cork is fitted into its place and the whole affair exactly counterpoised on the balance. This done, the instrument is inclined so that the acid may run slowly out of the tube and mix with the alkali below, displacing the carbonic acid, which escapes with effervescence. When the decomposition appears complete, the liquid in the flask is to be heated until it begins to boil, so that the carbonic acid may be completely expelled and the upper part of the vessel filled with steam. It is now suffered to cool, and when it has reached the temperature of the air, the loss of weight undergone indicates of course the carbonic acid present in the compound. The use of the little chloride-of-calcium tube is to retain vapour of water which would otherwise increase the loss and lead to serious error.

The acid to be used depends upon the carbonate under assay; if it be carbonate of potash, soda, ammonia, or magnesia, oil of vitriol is best; if carbonate of lime, it is proper to use hydrochloric acid. It is necessary also to have an excess of acid—a point easily ascertained by a rough preliminary experiment.

With this little instrument results are got of surprising accuracy; the error ought not to exceed one or two tenths of a grain. It will be needless to point out the numerous useful purposes to which, in the hands of an ingenious practical operator, it may be applied.

Hydrocyanic Acid.—There is perhaps no medicinal agent the employment of which requires greater attention and care than this most valuable, and at the same time most dangerous substance, its effects are so potent, that a small error in the adjustment of the dose may easily lead to most disastrous consequences to all parties concerned. Previous to the publication of the present London Pharmacopœia, no rule of uniformity in point

of strength existed among Druggists; it was in fact not a recognised medicine. At the present moment this is no longer the case; an acid of a certain specific strength is ordered to be kept, and nothing can excuse deviation from the uniformity so indispensable to the safe use of the substance in question.

Hydrocyanic acid is, as is well known, both very volatile and very prone to decomposition, our samples are constantly subject to alteration; under these circumstances, it becomes desirable in the highest degree to have some ready and simple method of estimating at any time their real strength. The following may be safely recommended as exceedingly accurate and not difficult of execution:

A known quantity of the acid, say 100 grains, is carefully weighed out in a little bottle the (specific-gravity bottle answers very well); this is transferred to a glass or capsule, and diluted if strong, the rinsings of the bottle being scrupulously added. A solution of nitrate of silver is then poured in, until the odour of the hydrocyanic acid disappears, the whole being well stirred. The white curdy precipitate is cyanide of silver, it must be collected on a filter previously weighed, washed clean with distilled water, dried at 212°, weighed, and the weight of the paper deducted. From the quantity of cyanide of silver, it is easy to deduce the corresponding quantity of hydrocyanic acid. The equivalent of the silver salt is 134.3, that of the acid, 27.3, hence,

$$134.3 : 27.3 :: x : x'$$

x and x' representing respectively the weights of the cyanide of silver obtained, and the real acid in the hundred grains of liquid.

It will be seen that the equivalent of the silver salt is very nearly five times as great as that of the acid; we might simplify the process, if it were needful, by reducing it to a division by five of the weight of the cyanide of silver obtained; or

$$\frac{x}{5} = x'$$

To make this experiment with accuracy it is needful to pay particular attention to the weighing of the filters; owing to the hygroscopic properties of paper it is better to weigh them in a state of dryness, easily obtained by a short exposure to the heat of the water-bath. The weighing, both of the empty filter and of the filter with the precipitate, should be conducted out of contact of air by slipping it quickly into a light wide glass tube, previously counterpoised. A more convenient plan is to use a very light thin flat case *,

* The contrivance of this very useful little instrument is due to Mr. Everitt, of Middlesex Hospital.

Silver weighing case.

made of silver, of the form represented; it may be about two and a half inches long, one and a half inch wide at the top, and about one quarter of an inch thick, the metal being about the substance of thin cardboard. A counterpoise is to be kept to avoid trouble. It is necessary after the experiment is completed, to examine the cyanide of silver, and make sure of the absence of chloride. This may be done by boiling it with pretty strong nitric acid, by which cyanide is decomposed and dissolved, while chloride remains unchanged. Cyanide of silver also yields metallic silver when heated to redness, which is not the case with chloride.

The purity and value of cyanide of potassium may be tested by the process described, the calculation being slightly altered to suit the equivalent of that base; any adulteration with chloride of potassium will thus be discovered.

In terminating these remarks, thus offered to your notice, being warned to do so by the lateness of the hour, I have to express my regret at not having been able to dispatch a greater number of cases out of the long list before me; there are many other substances which it would have been highly advantageous to discuss, such as the examination of bleaching powder, of commercial oxide of manganese, &c., had circumstances permitted. There are a great number of cases, however, in which the mere specific gravity of a liquid constitutes a valuable character—alcohol is a case in point; and I venture to recommend to all engaged in employments involving enquiries of this kind, to familiarize themselves with the practice of this most useful operation.

[Some of our Correspondents having requested us to insert, for the benefit of Associates, a few particular instructions for taking the specific gravities of fluids, &c. Mr. Fownes has, at our suggestion, drawn up a short article on the subject as a sequel to his lecture. We are obliged to defer its insertion until next month for want of space.—Ed.]

PHARMACEUTICAL MEETING,

FEBRUARY 8th, 1843.

MR. PAYNE, VICE-PRESIDENT, IN THE CHAIR.

ON THE PREPARATION OF CYANIDE OF POTASSIUM AND OF EXTEMPORANEOUS PRUSSIC ACID.

BY PROFESSOR DONOVAN, OF DUBLIN.

Of all known poisons, pure prussic acid proves the most suddenly mortal. A particle of it applied to the tongue of a vigorous dog, caused him to fall down dead, after two or three deep inspirations; and a single drop being injected into the jugular vein of another dog, he fell dead, as if struck by lightning (*An. de Chim. et de Phys.*, vi., 349). M. Scharinger, of Vienna, having accidentally spilled a little on his arm, died in a few hours in the greatest agonies (Phil. Mag., xlv., 76). Nay, smelling it is said to have produced death; and even breathing air impregnated with its vapour, occasions much inconvenience (Magendie). It is also destructive to vegetables.

Prussic acid, in the state of concentration that manifests such tremendous energy, is unmanageable as a medicine, perishable in constitution, and liable to continual and rapid variation of strength. To remedy these defects to a certain extent, dilution alone is sufficient, for in that state it suffers comparatively little alteration during a long time. Gradually, however, it loses its power, although sufficient remains unaltered to communicate its peculiar smell. I have seen in the laboratory of Trinity College, Dublin, medicinal prussic acid prepared seventeen years since, by Dr. Barker, which still retains its odour.

The prussic acid sold as medicinal, varies fearfully in strength, owing to original differences in the degree of dilution, and other causes. It has been found in the London shops to vary, in the quantity of anhydrous acid contained in it, from 1.4 per cent. to 5.8; and Dr. Fyfe found it to vary in Edinburgh from 1 to 4 (Christison's Dispens., *see also* Magendie's Formulary, translated by Dr. Gully, page 85.) There are many sources of uncertainty in the constitution of the medicinal acid. The rapidity of the distillation; the difference of temperature at which the conden-

sation of the vapour has been effected; the length of the condensing tube; the dryness of the cyanide of mercury (P.D.), and the strength of the muriatic acid made use of to decompose it; the age of the acid produced; the care with which it has been preserved from light, air, and evaporation, are all causes which influence its strength.

The following are the opinions of two competent judges, MM. Robiquet and Villermé: "Its extreme volatility, and the great facility with which its elements separate, are causes which render its mode of action unequal and uncertain. Of the numerous processes which have been proposed for obtaining it, none of them obviate this inconvenience. It has been supposed that prussic acid, prepared by the decomposition of ferro-prussiate of potash by sulphuric acid, keeps longer than if it were prepared otherwise; but that difference holds good only with regard to a different degree of concentration. Whatever process is employed, prussic acid will always alter in the same manner when diluted with the same quantity of water, and that alteration will be rapid in proportion to the degree of concentration." (*Journal de Physiologie, par Magendie*, iii., 224).

Induced by conviction of the little reliance that is to be placed on ordinary prussic acid, MM. Robiquet and Villermé sought a succedaneum possessing the virtues without the uncertainty of this medicine. Robiquet had ascertained that when ferrocyanide of potassium is exposed to a long-continued high temperature, the two cyanides which constitute the salt are differently affected, after the water has been expelled—the cyanide of iron is completely decomposed, leaving a residuum of iron and carbon, while the cyanide of potassium is in no respect altered, except by the mechanical admixture of that residuum. The mass, when thrown into water, readily dissolves, with the exception of the iron and carbon, which subside, and the cyanide of potassium is resolved into hydrocyanate of potash.

It is known that prussic acid, when pure, has not the power of saturating alkalies. It may in fact be considered, in some degree, free in the solution of hydrocyanate of potash. The cyanide of potassium is then a substance capable of representing all the properties of prussic acid, without being, like it, subject to the great inconvenience of speedy decomposition. It may be preserved indefinitely, provided it be protected from moisture and the contact of air.

MM. Robiquet and Villermé, observing on this cyanide, express themselves as follows:

"We will add, that the result of our experiments is, that a solution of cyanide of potassium loses less quickly and less easily its disagreeable odour, and the property of acting on the nervous system, than prussic acid equally

diluted with water. On this account, the difference between the two substances is very sensible. We know that potash retains and fixes prussic acid, but without saturating it.

"The action of cyanide of potassium was such, that with one-tenth of a grain of this salt, a linnet was killed in thirty seconds after the first symptoms of poisoning were manifested; and less than a grain destroyed a large Guinea-pig in two or three minutes.

"As to the hydrocyanate of potash, a small drop, containing no more than one-hundredth of a grain of the cyanide, caused a linnet to fall dead within half-a-minute. Six drops, containing only the twelfth part of a grain, killed a half-grown Guinea-pig within three hours; and a demi-gros, containing five grains of the salt, killed a robust pointer-dog in a quarter of an hour."

In conclusion, MM. Robiquet and Villermé observe, that we can instantly remove the minute quantity of potassium that exists in the cyanide, and convert its other element into prussic acid, by adding to the solution of the salt a few drops of any vegetable acid, or prescribing with it an acid syrup.

The following is the description which Robiquet had given, two years previously, of the manner in which he prepared the cyanide of potassium:

"A quantity of ferrocyanide of potassium was introduced into a stoneware retort, to which an apparatus for collecting the gas was attached. A gradually-increased heat being applied, gas was disengaged, and it continued to come over during five hours—at one time, in such vast quantity that the rupture of the vessel was apprehended. This emission rendered it necessary to moderate the heat. The gas consisted of ammonia, carbonic acid, prussic acid, oxide of carbon, carburetted hydrogen, and azote in great quantity. When the extrication of gas ceased, the retort was found to contain a black spongy crystalline mass, very alkaline, and having a strong taste of prussic acid. It instantly dissolved in water, and produced a considerable reduction of temperature. The solution was perfectly colourless, but contained large floating black flocks; when filtered it possessed all the properties of pure hydrocyanate of potash. The flocks proved to be metallic iron and carbon. The black spongy mass found in the retort, was therefore cyanide of potassium mixed with the iron and carbon which resulted from the decomposition of the cyanide of iron, that decomposition being perfect and total."—(*An. de Chim. et de Phys.* xvii. 206.)

Robiquet, at that time, pursued the matter no further. As, however, the process afforded an impure cyanide unfit for medical use, it became an object with medical practitioners, as well as with Chemists, to remove the black matter, and to obtain the cyanide in a state of purity.

Solution and filtration presented an obvious method of effecting the former object, but to obtain the cyanide from the solution of hydrocyanate, presented difficulties. Many Chemists imagined that evaporation and crystallization, in the usual manner, are sufficient. Berzelius directed that the solution, originally made as much concentrated as possible, shall be evaporated in a vacuum over sulphuric acid; and this process was adopted in the American Dispensatory (Appendix, 1070), difficult and expensive as it is.

The reason assigned by Berzelius for recommending evaporation in a vacuum, is, that during evaporation by heat, the salt is transformed into carbonate of ammonia and hydrocyanate of ammonia (*Traité de Chimie*, iii., 384). Others have affirmed, that by mere solution in cold water, the cyanide is immediately converted into ammonia and formate of potash—an obvious error. Guibourt observes, that "several persons have proposed to deprive the cyanide of the carburet of iron [he conceives the carbon and iron to be in combination] which it contains, by solution in water and crystallization, but it is partly decomposed during that manipulation." (*Pharmacopée Raisonnée*, ii., 392). Professors Liebig and Gregory say, that "the cyanide of potassium is converted, when dissolved in water, into hydrocyanate of potash; if the solution be evaporated with an excess of potash, the whole of the nitrogen is evolved as ammonia, and formate of potassa remains." (*Turner's Chemistry*).

It appears, however, that other decompositions, beside those necessary for the production of hydrocyanate of potash, take place when cyanide of potassium is dissolved in water and evaporated by heat. In a medical point of view, it is of no consequence whether the resulting salts are such as are represented, if it be a fact that, during the evaporation, prussic acid is eliminated and expelled. To satisfy myself on this latter point, I dissolved cyanide of potassium in water, and distilled off a portion in a retort. To the distilled liquor I added some dilute solution of sulphate of iron, a little solution of potash, and, finally, a few drops of muriatic acid; a blue liquid resulted, which, after some time, let fall Prussian blue. The original distilled liquor had also a strong smell of prussic acid; it dissolved a little peroxide of mercury, and almost instantly killed flies which happened to fall into it.

From all these considerations, it is obvious that it is objectionable to evaporate and crystallize the solution obtained by dissolving the black mass already described, and filtering the solution. We do not thus procure a perfect cyanide, for a partial decomposition takes place, and prussic acid, more or less in quantity, according to the ratio of the water, will be expelled during the evaporation.

But this is not the only injury that will result. During evaporation, an additional quantity of hydrocyanate of potash will be decomposed by carbonic acid derived from the atmosphere; carbonate of potash will therefore remain mixed with the salt when solidified, and accordingly, I have found that the affusion of very dilute sulphuric acid on commercial cyanide of potassium occasioned effervescence. Mr. Laming had already noticed the same fact (*London Medical Gazette*, xii., 640).

So certain are these three agents, moisture, carbonic acid, and

heat, of decomposing this salt, that although, when perfectly dry, it has no smell, merely breathing on it will evolve prussic acid, easily discoverable by its odour.

Others have proposed that alcohol should be used, instead of water, to dissolve away the pure cyanide from the black mass. Alcohol is capable of acting as a solvent only when very hot; whatever in that state it dissolves will, for the most part, be deposited on cooling. But even in this case, prussic acid is abstracted, and if the solution be distilled, it will be found in the product, by treating it with sulphate of iron, potash, and muriatic acid in the usual manner. Alcohol dissolves this cyanide very sparingly, and hence the process would be too expensive, as distillation cannot be resorted to for recovering the alcohol.

Independently of the foregoing objections, there is one which would render the method of lixiviation and evaporation ineligible. The resulting cyanide would contain a variable quantity of accidental water, even when alcohol had been the solvent; for alcohol, to be an adequate solvent, must be of specific gravity 0.896, or nearly, and therefore will contain forty per cent. by weight of water. To expel the water with the necessary degree of certainty, a red heat must be employed, and at this temperature a portion of the cyanide of potassium would be converted into cyanate of potash, unless the ignition were conducted in a vessel from which the atmosphere is excluded. The whole process would, under such circumstances, become too troublesome, difficult, and expensive for ordinary use.

Thus none of the foregoing methods of obtaining cyanide of potassium is to be depended on for attaining the constancy of composition, which is necessary to a medicine possessed of such amazing energy. The process of Robiquet has, since its first promulgation, been modified in a manner apparently trivial, but the results of the modification are in the highest degree important. The improvement consists merely in the application of a higher temperature, and the continuance of it for a greater length of time; it is detailed in the Codex Français, 1837, as follows:—

"Reduce protocyanuret of potassium and iron to coarse powder, half fill a retort with it, place the retort in a good reverberatory furnace, adapt a tube to collect the gas, heat moderately to expel the water of crystallization, then raise the temperature to the fusion of the matter, which will be announced by a disengagement of gas; support the temperature so that the disengagement will be regular and moderate; increase progressively the heat, and maintain it at a very high degree for a quarter of an hour, close the extremity of the tube, close also the apertures of the furnace, and leave the whole to cool. Then break the retort, carefully detach the upper stratum, which forms a kind of well-fused enamel. This is the pure cyanide of potassium. Include it in a well-ground stopper-bottle. Remove

afterwards the spongy black mass which is found in the lower part; include it also in bottles. The dose of this black cyanide is more difficult to regulate."

It may be added, that the black cyanide is totally unfit for medical use.

The chief difference between this and the original process of Robiquet is the more perfect fusion of the salt, the consequent complete subsidence of the black matter to the bottom, and the more perfect separation of the enamel-like pure white cyanide which continues to occupy the upper stratum during liquefaction as well as after the subsequent solidification, the boundary between each being well defined Thus the grand object is at once attained.

Cyanide of potassium thus prepared, is a beautiful white crystalline mass; fusible, without change, by heat; unalterable even by a white heat, provided air be excluded. When protected from air and moisture, it preserves its constitution indefinitely. When its colour is yellow, or when it contains some yellow crystals, or when its solution is not colourless, it has not been subjected to a heat sufficiently high, and it contains iron, which, even in very small quantity, greatly lessens the medicinal power of prussic acid in its combinations. It should have no smell: if it have a smell, it contains water, is of uncertain strength, and is perhaps suffering slow decomposition. All acids decompose it, even the carbonic. Exposed to air, it absorbs moisture; and in damp air deliquesces perfectly, although it does so slowly.

The process of the Codex, excellent as it is in principle, occasions not a little trouble in practice; is liable to accidents and failure, and affords a very scanty product. The stoneware retort is apt to crack in the fire, unless previously well coated with fireclay and well dried: it is, when largest, incapable of containing much; yet it must be but half-filled; and of the product, very small as it is, less than half is pure white cyanide. I have therefore, in preparing a sufficient supply of the salt, modified the process in such a manner as to render it less difficult, its success less contingent, and its produce more abundant, as follows:—

In place of a coated stoneware retort I use an iron vessel, for this metal has no bad effect on the cyanide. A cast-iron bottle, such as is sold for chemical purposes, will not answer: in my trials, the metal partially melted before it had attained the temperature at which the completeness of the decomposition can be relied on, and before the deposition of the black matter to the bottom has been secured. The vessel must be of forged iron; and a quicksilver bottle will answer perfectly, provided it be sound. In its screw-plug, must be fitted an iron tube so bent that its

other extremity may be plunged half an inch below the surface of a little water contained in a cup. This tube is necessary, for during the intense ignition, access of air would partially convert the cyanide of potassium into cyanate of potash. The tube is also convenient as a means of observing the rapidity of the issue of gas, which is violent, and, it is said, even dangerous, unless the heat be at first moderate. By it we can also judge when the decomposition is complete, which will be shown by the cessation of gas-bubbles, notwithstanding that a white heat is maintained.

The precaution of dipping the end of the tube no more than half an inch in the cup of water is necessary, to prevent the contingent ascent of the water into the white-hot bottle, and the explosion which the sudden formation of steam and hydrogen would produce. Should diminution of temperature cause contraction of the gas contained in the bottle, the water, after ascending a few inches in the tube, will depress the level of the water in the cup so low that the end of the tube will be uncovered, and common air will be thus allowed to enter.

The iron bottle is to be but half filled with recrystallized ferrocyanide of potassium—space will thus be left for the swelling of the salt. It is to be introduced into a good air-furnace, and a moderate fire maintained until the issue of bubbles become less violent. The heat is now to be raised gradually to whiteness, and thus sustained for half an hour. The end of the tube plunged in water is then to be corked. The iron bottle, when cold, is to be cut in two by a chisel and heavy hammer—any expert smith can do it: the pure white upper stratum of salt is to be cut out with a small chisel and hammer, enclosing each piece as soon as cut out, in a well-stoppered bottle. Under this pure white stratum, and well defined from it, will be found the black portion; it contains much of the cyanide, and will answer for various purposes, but is unfit for internal exhibition.

During the heating of the salt in the iron bottle, the conducting tube first becomes heated by the transmitted steam; and even before this ceases, an inflammable gas comes over, which, when kindled, burns blue. Although the bottle increases in heat, the conducting tube cools, and then a gas which burns white makes its appearance. When the bottle is thoroughly red-hot, the gas, now very abundant, is no longer combustible, but extinguishes flame: it has an intolerably pungent odour of ammonia mixed with prussic acid.

By this process, a beautiful white salt, possessing full medicinal energy, and never varying in properties in the least degree, is obtained: for nothing can remain in the upper stratum of the contents of the retort, at that elevated temperature, but pure cyanide of potassium.

By solution in cold water, this salt is converted into hydrocyanate of potash, which retains its medicinal power longer than is generally supposed. That this is so, appears from the following experiment made by Dr. Burton of Dublin, in the presence of Sir Henry Marsh, Dr. Banks, and myself. I had prepared the solution of hydrocyanate two years before, and during that period it had not been taken any particular care of. Dr. Burton contrived to introduce the point of a pen, which had been dipped in the solution, into the mouth of a mouse then recently taken in a trap. I calculated that the portion of the solution, thus introduced into the mouth of the mouse, could not have contained one-fiftieth of a grain of the cyanide; yet the mouse, after a momentary struggle, fell dead. Another, similarly treated, met a still more immediate death. He then tried on a third mouse the same experiment, substituting prussic acid made by me two years before, according to the process of the Dublin Pharmacopœia; but it had no effect whatever. It is true, that only two drachms of the acid was contained in a six-ounce phial; but it had been kept corked, and secluded from light.

With all the advantages of energy of effect, constancy of composition, permanence of constitution, identity of medical power at all times and in all situations, provided it be properly preserved, the cyanide of potassium labours under one grand defect, in whatsoever manner it may have been prepared. It unfortunately happens, that this salt attracts moisture from the atmosphere, the obvious consequence of which is, that if exposed to air, any given quantity will continually become weaker in medicinal power; first, because it now contains water, and next, because this water causes the exhalation of prussic acid. The preservation of the salt from the injurious effects of exposure is an object just as important as the excellence of the process for preparing it originally. Here also there is some difficulty. Although the cyanide may be preserved in a well-ground stopper-bottle, the constant necessity of opening the bottle in a compounding establishment (supposing this medicine in extensive use) will at length produce the worst effects.

The misfortune does not stop here, every one knows that it has been proposed to prepare extemporaneous prussic acid of unvarying strength, by the decomposition of cyanide of potassium, effected by tartaric acid; see the process, and a discussion on it between the proposer (Dr. Clarke) and Mr. Laming, in the Glasgow Medical Journal, No. 14, 1831; Lancet, 1831; London Medical Gazette, xii., 640. I have obtained commercial cyanide of potassium to all appearance fit for medical use, which, instead of being dry, contained as much as 12 per cent. of water. In order to discover how much water this commercial salt was

capable of holding, without losing its crystalline form, I heated a quantity of it nearly red-hot, then quickly weighed .100 grains, and left it exposed to a damp atmosphere. After three days, it was still in crystals, although obviously damp; its weight was now 123 grains; thus it had attracted nearly one-fourth of its weight of water, yet still remained in a state which might deceive the unwary. Prussic acid made from a salt thus liable to such variations would therefore deserve little more confidence than officinal prussic acid, and it would appear that the preference given by the London and Edinburgh Colleges to ferrocyanide of potassium, or to cyanide of silver, is well founded.

Robiquet and Villermé had proposed that prussic acid should be evolved at the moment when it is to be used medicinally, by mixing an acid with cyanide of potassium, but they preferred the exhibition of the cyanide itself, as a medicine of never-varying strength. Viewing the proposal with reference to the preceding facts, it loses much of its value, unless means be contrived to guard, with certainty, against the absorption of moisture during the many and long-continued exposures to which neglect may subject it.

The plan which I suggest is, that consumers should keep the cyanide of potassium in small wide-mouthed well-stoppered bottles, not quite filled with the salt, but completely filled with alcohol of 0.800. Alcohol of this strength exerts scarcely any solvent power on the cyanide, but it will effectually preserve it from the deteriorating influence of the air. When a few grains are required for use, they may be drawn up by an iron wire, like potassium out of naphtha, and heated in a spoon for a moment to drive off the adhering alcohol.

But there is a better, although a more troublesome plan of preservation than this. Let a glass tube of one-fourth of an inch bore, and twelve or fifteen inches long, of the slightest substance, be sealed at one end over a jet of burning gas, or other large flame. Let it be filled with cyanide of potassium, broken as speedily as possible into coarse powder or fragments, and then let the other end be sealed. In this state the salt will never change. When a small quantity is wanted for use, one of the sealed ends is to be cut off with a sharp file. After withdrawing the quantity required, the cut end may be sealed again at the flame. Every Chemist is expert in the art of cutting and sealing tubes.

I have not deemed it necessary to introduce in this communication the new process of Liebig for preparing cyanide of potassium. It is economical, and produces an article well suited to the purposes of the arts, but as the resulting cyanide contains also cyanate of potash, it is unfit for medical use.

The dose of cyanide of potassium is estimated by Magendie at a quarter of a grain. If it be desirable to convert this into prussic acid, by prescribing it in solution with any weak acid, as syrup of lemon-juice, it is proper to modify the dose. I find, by calculation, that a quarter of a grain of cyanide is equal (*qu. pr.*) to five minims of prussic acid of the strength indicated by the London Pharmacopœia, or to three and a half minims of the strength of the Dublin Pharmacopœia, or to three minims of the Edinburgh Pharmacopœia. It appears to me that these are too large for commencing doses, and, if so, we must infer either that cyanide of potassium does not possess medicinal power equivalent to that of the prussic acid into which it may be transformed, or that Magendie's cyanide contained, or was partially decomposed by water; and from the description which he gives of the process adopted for preparing it, I incline to the latter supposition. Of the cyanide described in this essay, it is very likely that one-eighth of a grain will be found a sufficient dose to commence with, even when the cyanide is converted into prussic acid by the addition of syrup of lemon-juice.

The above numbers, representing the strength of prussic acid of the three Pharmacopœias, are thus derived:—I find by calculation that the strength of the prussic acid produced by the process of the Dublin College, is such that each hundred parts by weight contain 2.82 parts of anhydrous acid. Liebig and Gregory (*Turner's Chemistry*) give data from which we may estimate an acid from the same quantity of materials at 2.5 of dry acid per cent. The London College calculate that their acid contains 2 per cent: but Geiger, who used very nearly the same ratio of materials as the London College, declares that the resulting acid is of the same strength as that of the Dublin College. The prussic acid of the Edinburgh College is estimated, in their Pharmacopœia, at 3.25 per cent. of anhydrous acid.

CONCLUSION.

By the methods described above, we obtain the cyanide of potassium in a state of permanent preservation, of invariable medicinal power, and of identical energy in all parts of the world; so that physicians cannot misconceive the doses which others found successful. At present, the recorded cases of alleviation or cure by prussic acid, are comparatively of little value on account of the uncertain strength employed in different countries, and by various practitioners; but cyanide of potassium is of the same power every where, and at all times if proper precautions be observed.

The objects of the foregoing essay are as follow:—After reminding practitioners of the many sources of uncertainty which

attend the medical employment of prussic acid, and of the advantages of cyanide of potassium as a succedaneum, I have endeavoured to show, that by the method of obtaining this cyanide practised in the British Isles, it is no more to be relied on than prussic acid itself; and that the French method of procuring it, improved by some facilities suggested by me, is the only one that can be depended on. I have adduced reasons for believing, that, even when rightly prepared, no sufficient precautions have been hitherto taken for preserving it in a state of equable energy, and a simple method of effecting this object has been proposed. As a consequence of these suggestions, an improvement in the mode of procuring extemporaneous prussic acid results, which presents the practitioner with that useful agent in a state of never-varying power.

The following is a proper formula when the object is to administer prussic acid produced extemporaneously from cyanide of potassium :

℞ Cyanidi Potassii granum.
Aquæ distillatæ uncias tres cum semisse.
Syrupi Limonum semiunciam.

Misce. Divide in haustus octo. Sumatur unus pro dosi.

11, *Clare Street, Dublin.*

Mr. Squire questioned the advantage of substituting cyanuret of potassium for hydrocyanic acid, as it was evident, even from Mr. Donovan's statement, that the salt requires great care in its preparation; and unless certain precautions be adopted, is as subject to change from keeping as the acid. He had more than once had occasion to point out to the Society, as the result of his experience, that hydrocyanic acid, of the strength ordered in the Pharmacopœia, might, with moderate care, be preserved unaltered for a great length of time.

The Chairman thought the Society was much indebted to Mr. Donovan for the practical information contained in his paper, it being always desirable to obtain the result of experience in such matters. It was, however, satisfactory on such occasions to hear the testimony of those who are familiar with the subject, in favour of the Pharmacopœia preparations.

ON SOME FACTS IN THE THERAPEUTIC USES AND CHEMICAL CONSTITUTION OF CALOMEL.

BY JOHN GARDNER, M.D.

The subject of this paper belongs both to the medical practitioner and the Chemist, and I trust that so much of the matter which must necessarily be introduced belonging especially to the

former, will interest you on account of its relation to that part of the subject more peculiarly your own.

In Dr. Pereira's well-known work, the article *Chloride of Mercury* sets forth very strikingly a great discrepancy existing in medical authors upon its therapeutic uses and effects. Its employment in hydrocephalus—Asiatic cholera—for the general purposes of a mercurial—and as a purgative, has been watched by innumerable practitioners, and their reports, compiled from very numerous sources, present assertions so directly opposed to each other, that Dr. Pereira says they appear to him to be irreconcilable. He quotes a passage from Gölis, to which I must invite your attention :—

"Wytt, Colier, Quin, Wilmer, Liel, and others," says Gölis, "gave calomel internally in far larger doses, as two, three, and more grains at a time, and continued its use many days in the same dose, without considering the many evacuations from the alimentary canal, or the violent cholic pains ; and they affirm. that they have never remarked from the effect of this agent given in these large doses, any bad consequences in the abdomen. Melancholy experience compels me to contradict them. Many times I saw, under those large and long-continued doses of calomel, the hydrocephalic symptoms suddenly vanish, and inflammation of the intestines arise, which terminated in death. Still oftener I observed this unfavourable accident from an incautious use of calomel in croup ; viz., where all the frightful symptoms of this tracheal inflammation, which threatened suffocation suddenly vanish, and enterites develope itself, which passed rapidly into gangrene, and destroyed the patient."

After this quotation Dr. Pereira proceeds to collect cases in which calomel has been found to act as an irritant poison, and others in which very large doses have produced effects which have led to its being denominated a *sedative*. This class of effects has been witnessed more especially in the treatment of cholera, and the authorities upon which the reports depend are so unquestionable, that it must be admitted as an established fact, that more cases of severe cholera have recovered under the use of prodigious doses of calomel than by any other means.

"We have the concurrent testimony of many practitioners that, in yellow fever, cholera, and other dangerous diseases, calomel, in doses of a scruple and upwards, allays vomiting and purging, and is actually sedative."

"I do not pretend," says Dr. Pereira, "to reconcile these cases with those recorded by Kellewig, Vagritius, Ledelius, Hoffman, and Gölis ; in fact, they appear to me irreconcilable. Dr. Christison, however, suggests that in those cases in which violent effects occurred the calomel might contain corrosive sublimate."

These discrepancies admit of another explanation, which will suggest, I hope, still further practical investigations than those I am about to relate.

Many years ago it happened that my attention was powerfully drawn to the subject of hydrocephalus, and I was led to study carefully the earliest symptoms which indicate its approach. A well known circumstance in the history of this disease, namely, the great probability of its occurrence to other children in a family where one

has been cut off by it, induces parents to watch very carefully for such symptoms as they are instructed to look for, and to seek our aid early. The effusion of fluid into the cavities or upon the surface of the brain, which gives a name to the disease, was long since admitted to be the result of a previous state of inflammation, and afterwards it was established that it is seldom that the symptoms of inflammation occur without a longer or shorter continuance of another state, to which the term *erythism* was applied by Dr. Whitlock Nicholl: more commonly, however, this state is designated *irritation*. An inseparable concomitant of that state of the infantile brain which is so called, is the occurrence of *white stools*, an appearance manifestly depending upon an altered condition of the bile. It is an interesting and important question, which of these circumstances precedes the other? Is the disturbance in the functions of the brain the *cause* or the effect of this remarkable action of the liver? We can prove that it is the brain, which, from whatever cause it may take on this diseased action, produces a secondary affection of the liver, decolouring its secretion; and the proof is this—that the brain is subject to a deviation from its normal state, antecedent to and irrespective of the irritation or erythism, an irregularity in its growth, traceable in the external form of the head to which, in a published pamphlet, I have applied the term *kephalosis* or morbid head. In children whose brain is developed in an irregular or abnormal manner, the state called erythism is peculiarly liable to occur, and its concomitant condition of the liver giving rise to white stools. Thus, it is certain the brain-affection is the *cause* not the *effect* of this symptom. It is also important to remark, that the white stools arising from brain-irritation are almost always associated with diarrhœa.

Now, laying aside the authorities for the use of the chloride of mercury in hydrocephalus and inflammation, its old repute for an action directly upon the liver naturally gave rise to its application in this state of disease. It was, however, found by many practitioners to add to, rather than diminish the evil, by purging, irritating the abdominal viscera, and producing a disease worse than that it was intended to remove. In my first attempts to treat these cases with calomel, I met with such a decided check from these untoward symptoms, that for some time I laid aside its use altogether, and tried to accomplish the desired purpose by such general means as medical authors have recommended. Accident, however, led me to notice a very remarkable difference in the physical appearance of two specimens of calomel, and at the same time a remark occurred to me, made by Dr. Plummer, in his paper in the Edinburgh Medical Essays, where he recommends his well-known pill, "that it is in vain to look for the beneficial effects of that pill, unless the materials are well levigated together and for

a considerable time." This suggested to me that the irritant effects of my calomel might have depended upon some difference in its physical state. I therefore resolved to try the new specimen, which was whiter in colour and considerably less in gravity; and in order to ensure its minute subdivision, I had it triturated for a long time with an equal quantity of chalk. The result was, that a totally different effect followed its use in these cases of brain-irritation in children; instead of adding to the irritation and increasing the purging, the first effect of a large dose—two, three, or more grains upon an infant, was always what is called sedative; that is, whereas the morbid restlessness or sleeplessness which is the characteristic of the diseases, might have lasted one, two, or more days and nights, a long quiet sleep followed immediately on its exhibition, and upon following it up with repeated doses, the stools became less frequent, and changed at first to a green colour, and afterwards became natural both in colour and texture, and the child was restored to health. It is upwards of ten years since I recognised this important difference in the therapeutic effects of different kinds of calomel, during which time I have administered it in hundreds of cases without a single instance of the occurrence of injurious effects. And it happens constantly that parents apply to me for these white powders, under the impression that they contain some sleeping drug, more safe than opium or any of the usual narcotics.

I have been content to employ the calomel I thus found to answer my purpose without further enquiry, until, very recently, some circumstances drawing my attention again to the subject, I referred to Dr. Pereira and other writers, and finding the discrepancies beforementioned, I deemed the subject worthy of further research.

In the first place, to determine the question as to the difference in the physical state of the various specimens, I examined several under the microscope, and found that crystalline fragments could be detected in some specimens in considerable proportions, and of far larger size than in others, every specimen I could procure varying much in this respect, although all of them were perfectly impalpable. The fine white light calomel I have been accustomed to employ, giving much fewer and far more minute crystalline particles than the calomel procured at Apothecaries' Hall, and of some celebrated makers. Being desirous of ascertaining by what process the former was prepared, I wrote to Mr. Davy, the maker, who kindly informed me—

"That his method of making chloride of mercury consists in forming the sulphate in the usual manner, and after mixture with chloride of sodium, subjecting it to distillation into a dry chamber, repeating the process two, three, or more times, until the chloride comes over quite white, and entirely free from perchloride. The advantages of this process Mr. Davy considers to be, its avoiding the powdering and washing, and yet obtaining a perfectly pure chloride in the state of an impalpable powder of a very white colour."

The calomel of Apothecaries' Hall must be presumed to be prepared by the process given in the Pharmacopœia. On applying the same microscopic power to the precipitated calomel obtained from the Dublin Hall, I could not find any crystalline particles whatever, but I have no experience of its therapeutic effects; which, however, must be presumed, from analogy, would be, in some important respects, different to either of the former.

In the French Codex I find three varieties of calomel—first, that prepared by sublimation; secondly, by sublimation into a chamber filled with steam; thirdly, by precipitation. In the French Dispensatories, at least in Soubeiran, *Noveau Traité de Pharmacie Théoretique et Pratique* (for there are differences of opinion amongst them), a specific difference of therapeutic effect is attributed to each kind of calomel. Of that produced by sublimation into a crystalline mass, and afterwards levigated and washed, he says, "This calomel is less active than the others, without doubt because it is less divided." Of the calomel sublimed into steam, he observes, that "it is almost the only kind now employed, its state of division renders it more active, so that it ought not to be given, except under special prescription. Precipitated calomel is absolutely the same composition as the other calomel, except that it retains a little adhering water; it is most active because it is more divided. Mr. Davy's calomel differs from all of these, and it appears to be far preferable to that sublimed into steam; the latter is said by many Chemists to retain obstinately an admixture of a portion of bichloride. Mr. Davy's process seems to be identical with that in use a century ago, and described in Dr. Pemberton's Dispensatory. The different methods of preparing this important remedy, I must leave to be decided upon by the manufacturing Chemists, confining myself to the suggestion, that three varieties should be always kept in the shops, and the prescriber should point out the variety he would wish to employ.

I have never met with any other distinction suggested by authors than that of a greater or less activity in the various kinds of calomel: but the peculiarity I have pointed out is far more important, and has other bearings upon the therapeutic history of this remedy. I can add my testimony to that of the numerous witnesses to its remarkable power of allaying the vomiting, purging, and spasms of malignant cholera, when given in very large doses. The only means, indeed, which I ever saw capable of making any impression upon that disease when in a severe form, was, half-dram doses of calomel given suspended in mucilage, and repeated as frequently as the spasms recurred. During the prevalence of that disease in London, in 1832, I had abundant opportunities of testing its value. To its effect in

cholera the term *sedative* has been applied; it is precisely analogous to the effect I have described as produced in brain irritation in children; and I am inclined to think, that something of the same kind might, in many instances, be traced where it is given for its secondary effects in other diseases; and even that its influence on the liver and bowels, when it is used as a purgative, is subsequent to an action which, for want of a better name, is called *sedative*.

We must not, however, be misled by this term. The symptoms of brain-irritation in children, allayed by calomel, may be *produced* by opium, white stools always following the use of three or four doses of the latter; and it is generally admitted that this drug has no power over the spasms or vomiting of cholera. None of the terms in use to distinguish the varieties of sedative medicines, such as narcotic, anti-spasmodic, &c., are applicable to the peculiar power of calomel over these disordered states of the nervous system. We greatly need a new nomenclature in therapeutics, but it must be preceded by more precise and minute distinctions in pathology.

There is a very general impression at present entertained that the medicinal effects of calomel depend upon the transformation of a portion in the stomach into the bichloride. M. Mialhe, in an elaborate paper in the *Annales de Chimie et de Physique, Juin*, 1842, has traced the history of this opinion; he says Capelle, in 1763, first recognized the dangerous character of a combination of calomel with sal ammonia; Proust, some years after, pointed out the transformation of calomel into corrosive sublimate by the influence of the alkaline chlorides. The repetition of this in many works at length fixed the attention of Physicians, and led M. Mialhe to perform numerous experiments, not only to establish this fact, but to ascertain the precise quantities of the calomel so transformed under various circumstances, and whether the presence of organized substances favoured or obstructed the transformation. There is, however, this serious source of error in his enquiries. The method he proposes to determine the question of the presence of corrosive sublimate, simply decides the fact of the presence of *some mercurial* in solution. It seems to have been assumed, without any attempt at proof, that the protochloride could not under any circumstances be dissolved. The analogy of the chloride of silver which, although extremely insoluble, is dissolved in a solution of chloride of sodium, and of chloride of ammonium, led me to suppose that the action of the alkaline chlorides upon calomel is simply to dissolve a portion of it; the test by sulphuret of ammonia not being distinctive of the perchloride.

Upon repeating such of M. Mialhe's experiments as related to the question, I am induced to believe such to be the case.

If we take equal weights of calomel, chloride of ammonium, and chloride of sodium, and add to them water at about 96°, then shake them for a few minutes, the filtered solution, tested with sulphuret of ammonium, indicates the presence of metal. In what state does it exist in that solution? Is it in combination with one or two equivalents of chlorine?

I took a normal solution of perchloride of mercury with the alkaline chlorides, and compared it with this solution; the former gave a yellow precipitate with the iodide of potassium, the latter gave no precipitate. The protochloride of tin precipitated the perchloride at first perfectly white, which, with an excess of the test becomes afterward grey; the solution in question is precipitated at once grey. I therefore conclude, that it contains protochloride of mercury in solution with the alkaline chlorides, and that the opinion which makes the activity of calomel depend upon the transformation of a portion of it into corrosive sublimate, is not more consonant with the chemical facts, than it is with the pathological.

M. Mialhe concludes from his experiments, that the amount of perchloride formed depends, not upon the quantity of the protochloride of mercury present, but upon that of the quantity of the alkaline chlorides in the solution. The quantity of the latter necessary upon his showing to produce a minute amount of the perchloride, can scarcely be presumed to be present in the stomach, and we might therefore argue from his own data, that this is *not* the cause of its medicinal value. It would follow, indeed, if his views upon this point were correct, that one grain of calomel ought to produce the same effect as five or ten, which is contrary to all experience.

It appears to me that a solution of chloride of ammonium, or of chloride of sodium, simply dissolves the protochloride of mercury; but it is very possible that double salts may be formed, as is supposed to be the case with the solution of chloride of silver; but upon this point I cannot speak with certainty. The subject appears to be important, and I hope to pursue it both chemically and pathologically, and I shall be happy to communicate such results as I may obtain to the Pharmaceutical Society.

46, *Great Portland Street.*

The Chairman observed, that while the Committee were fully sensible of the value of the paper, they had taken a liberty with it on that occasion, in omitting some passages which had reference to pathology and medical practice, which subjects it was desirable to exclude from any discussion which might take place, as being foreign to the purpose of the meeting. As it appeared, however, that the arguments of the author were, in a great measure, dependent on the medical facts adduced, the paper would be printed entire in the Journal.

Mr. Squire remarked, that there was certainly a considerable difference between the calomel sublimed into steam and that prepared in the old method; the former being a very white impalpable powder, and not so subject as the other to assume a yellow tint by the action of light. On this account the preference was generally given to the calomel prepared by steam.

The Chairman enquired, whether the author of the paper considered it absolutely necessary to keep more than one kind of calomel? or whether, if one kind should be found to be more active than the others, it might not answer as well to employ that in all cases, regulating the dose according to the effect required?

Mr. Gardner replied, that his observations on the effects of the different kinds of calomel had reference not merely to their comparative strength, but to the nature of their action on the system. In some cases t might be desirable to produce a certain amount of irritation in the intestinal canal, when a purgative effect was desired; in these cases a different kind of calomel would be indicated from that which would be appropriate as a sedative. He had observed, that the calomel prepared by Mr. Davy's process was of a beautiful white colour, and in a very fine state of division; and he had never observed any change of colour to take place in it. Since he had obtained this kind of calomel he had never used any other. He also adverted to an article by M. Soubeiran, in the December number of the *Journal de Pharmacie.*

Mr. Redwood stated, that the French Chemists had for some time past, been endeavouring to discover the cause of the superiority of the English calomel over the French. The process of preparing calomel by steam appeared to have been more generally known in France than in this country, as it was described in most of the continental works on Pharmacy, and an improvement in the apparatus had been suggested by M. Henry, of Paris. There were some practical points on which they had found some difficulty, which had reference chiefly to the material of which the vessels were composed. The continental Chemists seemed to have considered it essential to employ glass or earthen vessels, which were expensive, and inconvenient from their liability to break. He (Mr. Redwood) believed that iron vessels, coated with clay, answered the purpose without being subject to this disadvantage. The chief improvement introduced by M. Soubeiran consisted in promoting the condensation of the vapour of calomel by cold air. This he had, in the first instance, effected by passing a current of air through a long tube in which the calomel was sublimed, but he had recently found it more advantageous to conduct the vapour into a large chamber, by which means it was condensed into a much finer powder than when the sublimation was conducted in a receiver of ordinary dimensions.

NOTICE OF A CHINESE ARTICLE OF THE MATERIA MEDICA, CALLED "SUMMER-PLANT-WINTER-WORM."

BY JONATHAN PEREIRA, M.D., F.R.S.,
Honorary Member of the Pharmaceutical Society.

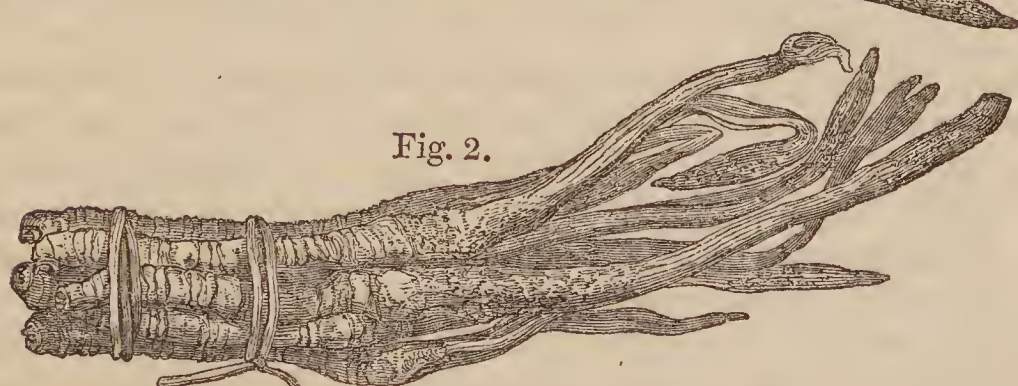
THE following brief notice of a remarkable and very interesting natural production, which is highly valued in China as an article of the Materia Medica, may not be uninteresting to the Members of the PHARMACEUTICAL SOCIETY.

The production to which I allude, is partly animal, partly vegetable. It consists of a caterpillar, out of whose neck grows a vegetable (a fungus or mushroom). The Chinese appear to regard it as partaking at one season of the animal, at another of the vegetable nature. Du Halde* calls it *Hia tsao tong tchong*, that is, *summer-plant-winter-worm.* Mr. Reeve, to whom I am indebted for some specimens of it, tells me that it is better known at Canton in the common dialect as *Tong chong ha cho*, which means *winter-worm-summer-plant.* This name, it will be perceived, consists of the same words differently spelt, and transposed. In Japan it is called *Totsu Kaso*†. In *Rees's Cyclopædia* there is a brief notice of it, under the name of *Hiastaotomtchom*, which is intended to mean *Heau tsaou tong chong* (*summer-plant-winter-worm*).

Mr. Reeve states that it is brought to Canton tied up in bundles, each containing about a dozen individuals.

Fig. 1.

Fig. 2.



Summer-Plant-Winter-Worm.
Fig. 1. Isolated individual. Fig 2. Bundle. (Natural size.)

Each individual is about three inches (a little more or less) long. About one-half of it is a caterpillar of the usual cylindrical form, and having a light yellowish brown colour. The head, neck, segments of the body, and legs (thoracic, ventral, and anal) are all distinctly recognizable. Projecting from the back part of the neck, is a slender club-shaped body. This is

* *Description Geographique et Historique de la Chine*, vol. iii., p. 490.

† Thunberg, *Travels in Europe, Asia, and Africa, between the years* 1770 *and* 1779, vol. iii., p. 68.

the fungus. It is, I think, a species of *Sphæria*, and is closely allied to the *Sphæria entomorrhiza**.

The lepidopterous insect, on whose larva this fungus grows, has not at present been determined. Mr. Doubleday, of the Zoological department of the British Museum, who has very carefully examined a very perfect larva, given to me by Mr. Reeves, is of opinion that the insect is a species of *Agrotis*.

Du Halde says, that the insect-fungus is scarce, and that at Pekin it is considered to be a foreign production. "It grows," he adds, "in Thibet; but it is found also, though in small quantity, on the frontiers of the province of Se-tchuen, which borders on Thibet or Laza."

I now proceed to notice the opinions of the Chinese regarding its medical properties and uses. Thunberg states, that it is reputed to possess cordial virtues. According to Du Halde, its properties are considered to be similar to those of *ging sing*. It strengthens and renovates the powers of the system which have been reduced either by over-exertion or long sickness. The physicians of the Emperor of China stated, that they used it only at the palace on account of its scarcity. Black, old, and rotten specimens cost four times their weight of silver.

The mode of employing it is very curious. The belly of a duck is to be stuffed with five drachms of the insect-fungus, and the

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* I subjoin a notice of the Sphæria entomorrhiza taken from the Rev. Mr. Berkeley's *Fungi*, forming vol. v., part 2, of Smith's *English Flora*.

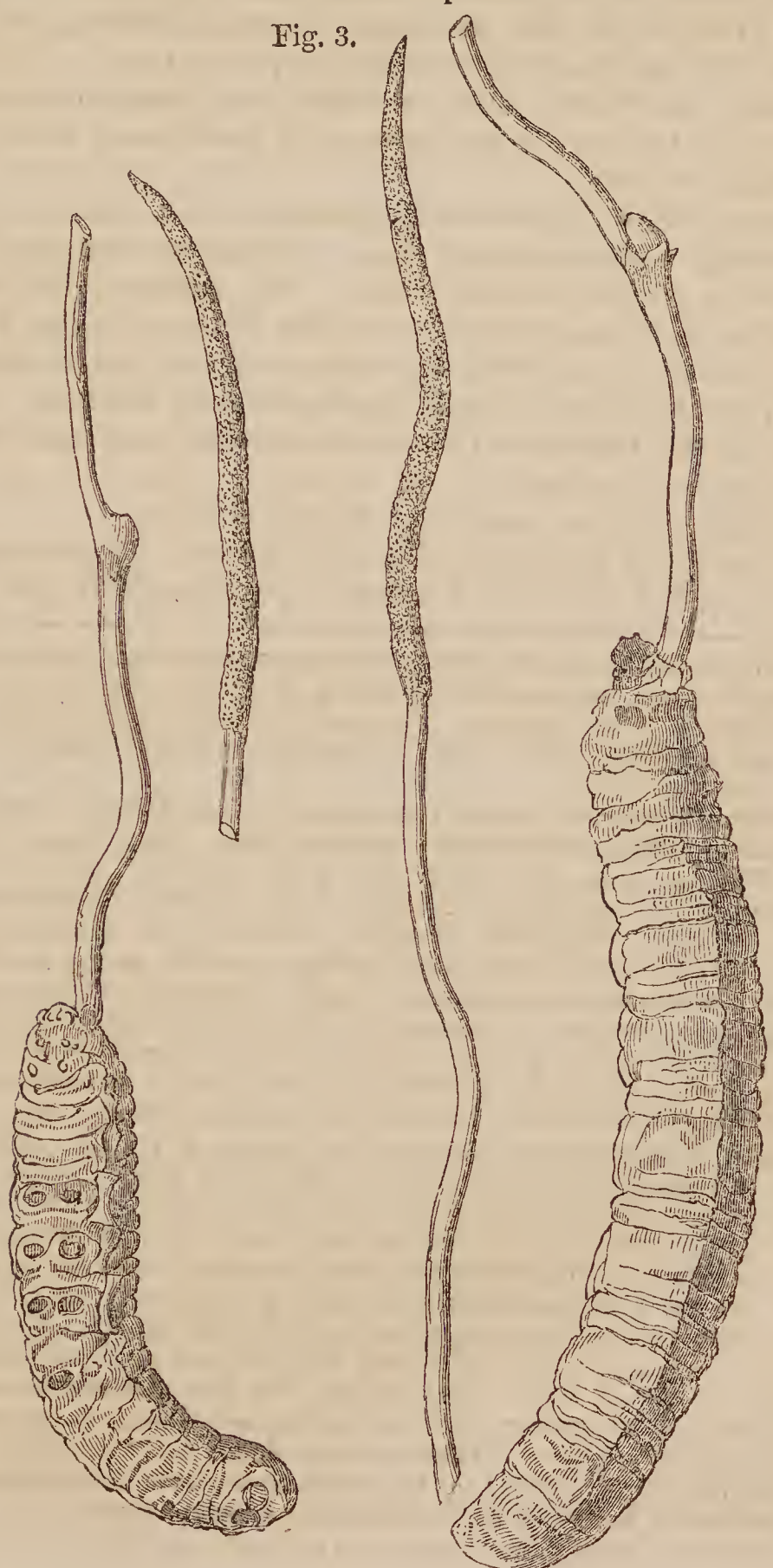
"SPHÆRIA. *Hall.* Sphæria. *Perithecia* rounded, entire, furnished at the apex with a minute orifice. *Asci* converging, at length dissolving. Name, from σφαιρα, a *sphere*.

Sphæria entomorrhiza, Dicks. (*roundheaded Insect Sphæria*); carnose, head subglobose, brown, stem slender, sporidia oblong. *Dicks. Crypt.* l. p. 22, t. 3, f. 3. *With* v. 4, p. 356. *Pers. Syn.* p. 4. *Fr. Syst Myc.* v. 2, p. 324. On dead larvæ and pupæ of insects. Very rare. Bulstrode. *Lightfoot.* Autumn. Edgefield, Norfolk. *Rev. R. B. Francis*, Apethorpe, Northts. May 17, 1835, *Rev. M. J. Berkley*. As the single specimen with which I have been so fortunate as to meet, according precisely with one in Dr. Hooker's Herbarium, gathered by Mr. Francis, differs from the figure of Dickson in having a larger elliptic head, immersed peritheeia, and a stouter stem, the following description will not be superfluous. *Head*, one-third of an inch long, broadly elliptic, quite distinct from the stem, changing from chestnut to bright red-brown, minutely dotted with the *ostiola*, of a tough fleshy consistence, nearly white within. *Stem*, two inches high, one line thick, nearly equal pale above, darker below, of the same colour as the head, but slightly mottled, almost smooth, giving out at the base numerous root-like filaments, in my specimen, attached to a chrysalis, in Dr. Hooker's, to a caterpillar. *Perithecia* completely sunk in the flesh, much elongated, gradually tapering to the orifice crown; their contents of the same colour, consisting of a very long flexuous *asci*, containing a double moniliform row of very minute oblong but not truncate *sporidia*, which, when the *asci* are broken, still partially adhere together, accompanied by more slender *paraphyses*. There is little doubt, notwithstanding the differences mentioned above, that the plant of Dickson is the same with that now before me, as the figure evidently represents an anomalous form arising from the larvæ having been deeply buried in the ground."

bird roasted by a slow fire. When done, take out the insect-fungus, the virtue of which will have passed into the duck's flesh. The latter is to be eaten twice a day for eight or ten days.

Parasitic fungus, from New Zealand. Sphæria Robertsii. —Another fungus, very analogous to the Chinese one, has within the last few years been discovered in New Zealand. It grows from the back of the neck of a caterpillar.

Fig. 3.



Sphæria Robertsii on the larva of a Lepidopterous Insect. (Natural size.)
In each Figure the Stipe is represented as if cut across.

The fungus is a species of Sphæria, which has been denominated the *Sphæria Robertsii**. It is six or eight inches long; dark or blackish, hard, with an elongated flexuous *stipe*, which, though simple in all the specimens yet examined, presents an appearance of being occasionally branched. The *head* or *capitulum* of the fungus is elongated, acuminate, and vermiform. The *root* of the fungus is imbedded in the head and part of the body of the caterpillar. One of the specimens placed on the table of the Society has two fungi growing out of its head.

The lepidopterous insect, on whose larva this fungus grows, is not uncommon in New Zealand. It is found only at the root of the rata tree (*Metrosideros robusta*), a myrtaceous plant.

Dieffenbach† suggests, that the insect is a species of Sphinx which feeds on the sweet potato (*Convolvulus batatas*); but the absence of any spine or horn on the last segment of the larva is an objection to this suggestion. Mr. Doubleday thinks that it may be *Hepialus virescens*, which is found at the root of the rata tree. He has a caterpillar apparently identical with that on which the fungus grows, and which is believed to be the larva of the Hepialus virescens.

Dr. O'Shaughnessy, who was present at the meeting, said that he had much pleasure in offering to the Pharmaceutical Society (an institution in the prosperity of which he felt much interest) a specimen of Cannabis Indica, or Indian hemp, which he had brought with him from Bengal. He had prepared a few observations on the therapeutic action of this remedy, but had been informed that they partook too much of a medical character to be appropriate in a Pharmaceutical meeting. As, however, the Pharmaceutical Chemist ought to be acquainted with the properties and doses of medicines, he would mention, that he had observed a difference in the action of the Indian hemp in this country, from what he had been accustomed to in Bengal. He had frequently obtained marked effects abroad, from the administration of half a grain of the extract, or even less, and had been accustomed to consider one grain and a half a large dose. In this country he had given as much as ten or twelve grains, and in some cases had been obliged to increase it still further before the desired effect was produced. It was important to remark, that its effect could not be considered complete until a tendency to coma was produced.

Dr. O'Shaughnessy then presented to the Society a specimen of the bark of the Strychnos Nux vomica, which he had himself stripped from the tree, and which he had identified with the

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* See Hooker's *Icones Plantarum*, vol. i., tab. xi.

† *Travels in New Zealand; with Contributions to the Geography, Geology, Botany, and Natural History of that Country*, London, 1843.

false Angustura circulated a few years ago on the continent. He considered this a very good specimen, as it possessed in a marked manner the peculiar characteristics of the bark, namely a rust-red colour on the exterior, which, on the application of nitric acid, assumed a green tint, while the same test applied to the interior produced a blood-red stain. In confirmation of his statement respecting the identity of this bark with the false Angustura, he stated that its effects on the system when administered internally, were precisely the same as those described by the German writers as resulting from the use of the other bark.

On the table were four specimens of cod-liver oil, which had been sent to the Society from Dublin, by Professor Donovan, and which were designated as brown, red, yellow, and pale.

THE SALE OF SPIRITS BY CHEMISTS AND DRUGGISTS.

Informations having been laid against several Chemists and Druggists in the metropolis, for selling spirits of wine, the Council of the Pharmaceutical Society appointed a deputation to wait upon the Commissioners of Excise, for the purpose of ascertaining the exact state of the law on the subject, and representing the peculiar position of the trade, in being liable to such informations for selling an article which is ordered in the Pharmacopœia as a medicinal agent.

The Commissioners readily granted the favour of an interview, received the deputation with great courtesy, and treated the subject with a degree of fairness and consideration which could not fail to give satisfaction. The deputation having stated the case, the Commissioners replied that they were fully aware of the perplexity which Chemists and Druggists suffered from the state of the law on the subject, and would gladly afford any assistance in their power; but it being their duty merely to enforce a compliance with the law, without favour or partiality, they had no alternative but to act upon informations received respecting any infringement which had taken place. The Commissioners stated that the law was imperative, and that it was decidedly unsafe for a Druggist to sell spirits of wine, knowing or suspecting that it was required for burning in lamps, making varnish, &c., but that they might sell it without hesitation when ordered by medical men, or required for medicinal use.

[We propose to insert the extracts from the Acts of Parliament in our next number.—Ed.]

DONATIONS TO THE LIBRARY.

		Presented by
Forster's Characteres generum Plantarum	1776	Mr. W. Ashford (Alford)
Gray's Natural Arrangement of British Plants	1821	
Pharmacopœia Augustiana	1672	Mr. Rowland (Liverpool)
Paris's Pharmacologia, Ninth edition	1843	Dr. Paris
Alibert's Eléméns de Thérapeutique	1804	Dr. P. H. Green
Ainslie's Materia Medica of Hindoostan	1813	Dr. Ashburner
Clendon on the Extraction of Teeth	1843	Mr. B. B. Orridge (Deptford)

DONATIONS TO THE MUSEUM.

Messrs. Godfrey & Cooke.—Opium of 1808—Barbadoes Aloes

Mr. Lloyd, *Ludgate Hill.*—Best Indigo from Bengal—Bad Indigo (Bombay Figs).

Mr. Chater, *Watford.* — Sarcocolla — Lactucarium of 1820 — Ditto of 1821—Opium from double purple poppy—Dragon's Blood.

Dr. O'Shaughnessy—Cannabis Indica (Indian Hemp)—Resinous Extract of ditto—Tincture of ditto—Churrus, an extract prepared in India—Bark of the Strychnos Nux Vomica.

Mr. Squire.—Fruit of the Carob Tree.

Mr Bell.—Cayenne Pepper, artificially coloured—Ditto, genuine.

Mr. Wheaton, *Sol's Row.*—Tartaric Acid, discoloured from exposure to light—Citric Acid, ditto.

Mr. Donovan, *Dublin.*—Four specimens of Cod-liver Oil.

EXTRACTED ARTICLES.

PREPARATION OF CALOMEL IN A STATE OF MINUTE DIVISION.

BY M. SOUBEIRAN.

Both medical experience and chemical science tend to prove that the minute division of calomel adds to its medicinal energy. Porphyrization is not sufficient to effect this purpose, it affords a yellow powder, which is never sufficiently impalpable. Joseph Jewel was the first who discovered another method of pulverization. He proposed to conduct the vapour of calomel into a vessel containing water in a state of ebullition, and the steam from the latter, mixing with the vapour of the calomel, caused its speedy aggregation in the form of an impalpable and uniform powder.

If this process of Joseph Jewel's be not absolutely impracticable, it is at least very difficult to perform, hence all those who have attempted to apply this process, have soon given it up. In 1822, M. Henry, convinced from practical experience that he could never arrive at any satisfactory result by adhering strictly to Jewel's process, suggested a modification of the apparatus,

which has been introduced into our laboratories, and is mentioned in most Pharmaceutical treatises. M. Henry's modification of the process consisted in having the steam generated in a separate vessel from that into which the vapour of the calomel is conducted. It is unnecessary to describe here the precautions which were necessary in conducting this process; it is sufficient to say, that those who have adopted this process, have found many practical difficulties, and not the least frequent has been the fracture of some of the vessels employed.

This process, notwithstanding its difficulties, being the only one employed in our laboratories, the practice has become almost universal, in France, of employing this finely-divided calomel. It must be admitted nevertheless, that in whiteness and fineness of division, the calomel prepared in France would not bear comparison with that imported from England.

In order to improve the product, and render the operation more easy, I proposed to substitute a current of air instead of steam, to effect the minute division of the calomel.

The apparatus consisted of an earthen tube placed across a furnace, in which the calomel in small lumps is heated. A current of air is passed continually through the tube by means of a centrifugal blowing-apparatus, so as to carry the vapour as it is formed into a receiver. If no obstacle be offered to the current, the calomel is in so fine a state of division, that it would be carried to a great distance; to obviate this, I found the best plan was, to make the tube terminate in a chamber divided into three stories by shelves running nearly across, and the communication from one to the other being at opposite sides of the chamber. The calomel was made to enter at the bottom of the chamber, while a pipe from the top, terminating in a vessel containing water, allowed the air to escape. This plan answered very well.

Numerous experiments, however, have induced me to relinquish this process in favour of another more simple, and in every respect satisfactory.

I now employ neither steam nor a current of air: my apparatus is composed simply of a tube and a receiver; and I obtain the calomel, in the finest state of division and of beautiful appearance, by a single operation. The principle of this operation is similar to that of the process for the manufacture of flowers of sulphur.

The vessels in which I heat the calomel are earthen tubes, about four inches in diameter and eighteen inches long. These are closed at one end and open at the other, and each tube contains from ten to fourteen pounds troy of calomel. The tubes which I use have been made with the clay employed in the manufacture of Paris crucibles. I have gone to the pains of having them coated on the outside with a layer of another kind of clay. By

this means they so far resist the action of the fire as to admit of being used several times.

The tube containing the calomel is placed in a furnace, the form of which is adapted to it, the open extremity of the tube protruding through an aperture made for that purpose, and communicating with a receiver. The receiver which I have hitherto employed is a large stone vase, with a hole pierced in the side to receive the open end of the tube. A small opening at the top, over which a plate of glass is laid, serves to allow of the escape of the diluted air.

Instead of this vessel, a small chamber may be built of brick-work attached to the furnace; but for operating on a few pounds, I prefer to use the vessel I have described.

The receiver ought to be placed as near as possible to the furnace, to prevent the calomel from condensing in the end of the tube. On the other hand, the receiver should be protected from the heat of the furnace: to effect this, the opening, at which the tube issues from the furnace, should be luted with clay, and two polished plates of metal should be placed between the furnace and the receiver to prevent the radiation of heat. Thus are accomplished the two conditions essential to success; the tube is heated to within a very short distance of its entrance into the receiver, by which means the calomel is prevented from condensing in the tube; and the receiver is preserved from the heat of the furnace, which, by raising the temperature of the air too high, would cause the calomel to be deposited in crystallized agglomerations instead of a finely-divided powder.

Nothing is more simple than the management of the fire. The tube is heated to dull redness at that part nearest to the receiver, then the fire is extended by degrees along its whole length. An hour and a half or two hours is sufficient to complete the sublimation of twelve or fourteen pounds of calomel.

When the operation is considered to be finished, the apparatus is unluted, and the calomel is washed with distilled water until the water ceases to be coloured by sulphuretted hydrogen. The calomel is afterwards dried by a very gentle heat.

Such is the very simple method of operating to which I have arrived, and I feel confident it is that which is kept secret by the manufacturers in England, for the calomel produced will bear comparison with the very best that is imported from that country. This is a triumph acquired to our commerce.

I am now occupied in applying this process to the division of other volatile mineral substances, and have already effected its application to some. The operation presents difficulties in the cases of orpiment and cinnabar, arising from these substances requiring the contact of air at a high temperature.—*Journal de Pharmacie.*

ON PYROGALLIC ACID,

AND SOME ASTRINGENT SUBSTANCES WHICH YIELD IT.

Dr. Stenhouse, in pursuing an elaborate series of investigations into the composition of Pyrogallic Acid, and of some astringent substances used in the arts, with a view of determining the quantity of tannin and gallic acid they may contain, has furnished some interesting remarks on nutgalls, sumach, valonia, oak-bark, divi-divi, kino, and catechu.

To procure the pyrogallic acid for his examination, he treated powdered nutgalls with water, and evaporated until he obtained an extract resembling catechu, which he sublimed in Mohr's apparatus, and thus obtained about 10.3 per cent. of pure crystals of the acid. In his analysis he found 0.312 to yield 0.65 carbonic acid, and 0.1345 water; this would be equal to

		Calculated.	Found.
8 Carbon	611.480	57.61	57.60
4 Hydrogen	49.918	4.70	4.78
4 Oxygen	400.000	37.69	37.62
	1061.398	100.00	100.00

In examining the substances which yield pyrogallic acid, Stenhouse states, that he could only obtain pure tannin from nutgalls, let his process be ever so carefully conducted. Pure tannin and gallic acid are the only substances which are known, by distillation, to yield pyrogallic acid. Taking advantage of this circumstance, he proceeded to test various substances for the presence of gallic acid, and to examine whether the tannin they contain is the same as that of nutgalls.

SUMACH.

Sumach, obtained from the small branches of Rhus coriaria, was digested in hot water, filtered, evaporated, and subjected to distillation. The fluid distilled over into the receiver gave no crystals of pyrogallic acid (owing to the empyreumatic oil; and impurities passing over with it); but it evidently contained the acid, and it appeared probable that sumach contained gallic acid and tannin, similar to that of nutgalls, an hypothesis which his subsequent analysis verified, for after treating a watery extract with alcohol, and again with æther, he obtained pure colourless crystals, which answered to the qualities of gallic acid, and on distillation yielded pyrogallic acid.

The tannin freed from gallic acid, subjected to distillation, yielded as much pyrogallic acid as the same quantity obtained from nutgalls would have given. He also succeeded in converting the tannin of sumach into gallic acid, by boiling it with dilute

sulphuric acid. In treating tannin precipitated from sumach by sulphuric acid with alcohol and æther, he procured crystals of gallic acid; sumach, therefore, most closely resembles nutgall, for which it has long been a substitute in the arts. The quantity of tannin it contains is, however, considerably less.

VALONIA.

The acorn of *Quercus ægilops*. Dried extract of valonia gave on distillation no signs of pyrogallic acid; in testing for gallic acid, a concentrated solution was precipitated by size—the fluid was evaporated—the extract boiled with alcohol—the alcohol distilled over—and the extract, treated with æther, yielded a small quantity of crystals having the properties of gallic acid, which, on distillation, gave pyrogallic acid, but in very limited quantity, about one-thirtieth of that of sumach. The solution of valonia, treated with sulphuric acid, gave but a trifling precipitate of tannin; distilled, it gave much charcoal, but no empyreumatic products. The fluid in the receiver was colourless, and had no traces of pyrogallic acid. The tannin of valonia differs materially from that of nutgalls.

OAK-BARK.

The extract, treated as the former, gave no traces of pyrogallic acid, even in subjecting large quantities of a decoction to examination he could not obtain crystals of gallic acid, which he concludes to exist in it in very minute quantities, if it exist in it. The tannin precipitated by sulphuric acid yielded no traces of pyrogallic acid on distillation, and appears, therefore, to differ from that of nutgalls.

DIVI-DIVI,

Imported from Carthage, is the pod of a leguminous shrub, the Cæsalpinia coriaria, according to Balfour. The extract, subjected to distillation, yields no traces of pyrogallic acid; but the fluid, passing over into the receiver, has its characteristic signs. By treating in the manner abovementioned, pure crystals of gallic acid may be obtained from it, which, on distillation, yield pyrogallic acid. Sulphuric acid gave, with a concentrated solution, but a very small precipitate, which, dried and distilled, yielded no trace of pyrogallic acid, but much charcoal. Thence the tannin of divi-divi differs materially from that of nutgall. The quantity of mucilage which it contains precludes it from the use of dyers; but as it contains much tannin, it is largely used for tanning.

KINO.

From the African kino he could obtain neither gallic acid, nor did the abundant precipitate produced by sulphuric acid, on distillation, show any traces of pyrogallic acid; nitric acid converted it into oxalic acid.

CATECHU.

Catechu contained no gallic acid but catechin, and a peculiar tannin, which is precipitated by sulphuric acid, and when boiled with dilute sulphuric acid, is of a dark brown colour, like the tannin of oak-bark. It is insoluble in cold or hot water, alcohol, or æther, and but trivially soluble in a solution of strong alkalies. Distilled, it gave no traces of pyrogallic acid or pyrocatechin.

Catechin, the part of catechu insoluble in cold water, yields on distillation the pyrocatechin of Zarenger.

SALICIN.

Charles Gerhardt was induced again to undertake the analysis of this substance, on account of the modification of the atomic number of carbon by Dumas and Stass.

In 100 parts he found

	I.	II.
Carbon	55.28	55.24
Hydrogen	6.50	6.53
Oxygen	38.22	38.23
	100.00	100.00

The quotients of these numbers, divided by the atomic weights, are

		At.	in 100 parts.
Carbon	1474	42	55.3
Hydrogen	1040	28	6.2
Oxygen	382	22	38.5

Annalen der Chemie und Pharmacie.

COMPOSITION OF THE OIL OF CORN SPIRIT.

J. Mulder communicated, in the *Natuur-en Scheikundig Archief*, the composition of this oil, a fluid which, by repeated rectification over carbonate of soda, consists of oil of corn $C_{24} H_{17} O_3$ and œnanthic æther $C_{18} H_{18} O_3$. This examination was again conducted by Wöhler and confirmed by Kolbe, who found in the oil of corn spirit, œnanthic æther, œnanthic acid, and besides this a considerable quantity of margaric acid, traces of which Mulder had seen and found in varying quantities. The cause of this variation is the difference in the quantity of fatty matter produced in the different distilleries, and dependent on the quality

of corn employed. To determine the source of the fatty matter, rye and malted barley, which are used by the distillers, were examined. Einhof, who has analysed barley, mentions no fatty matter, whilst Vauquelin and Fourcroy obtained from barley by alcohol one per cent. of oil of corn spirit. This result might be the oil of corn without margaric, elaic, and fatty acids. Eihnof found no fat in rye. The presence of margaric acid in the products of the stills of corn spirit Gerhardt has confirmed, but could only with difficulty obtain it free from œnanthic acid.

A salt of silver yielded

		At.	Calculated.
Carbon	75.83	34	78.50
Hydrogen	12.03	33	12.44
Oxygen	12.14	3	9.06

A salt of lead re-crystallized from alcohol, gave a result corresponding with margaric acid, viz. 54.57 per cent. carbon, and 8.86 hydrogen. He thinks it not improbable that the margaric acid is formed by a transposition of the elements of œnanthic acid in the sublimation, as Liebig and Pelouze found more hydrogen than the formula requires, and he himself always obtained from the acid more hydrogen.

	At.	Calculated.	I.	II.	III.	Margaric Acid.
Carbon	14	74.71	74.32	75.01		75.92
Hydrogen	13	11.33	12 25	12.17	11.86	12.39
Oxygen	2	13.96	13.43	12.82		11.69

These differences in the quantity of hydrogen can only be explained by supposing an alteration of the substance during sublimation, which he found in reality to be the case.

To demonstrate this conversion of œnanthic acid into margaric acid clearly, it is necessary to employ the acid obtained from French brandy.

Annalen der Chemie und Pharmacie.

ON GAMBOGE.

BY DR. BUCHNER.

This substance is obtained from several plants, as Garcinia Gambogia, Gambogia Gutta (Linnæus), Mangostana Gambogia (Gaertner), Stalagmites gambagioides, Hypericum bacciferum and cayanense, natives of the East Indies, Siam, and Ceylon, whence it is imported in form of small cakes and rolls, or cylindrically-twisted masses. Its composition, according to Christison, is resin, gum, fecula, fibrine, and water. The resin must be regarded as the chief constituent, and is most abundant in the Ceylon variety: it contains about 75.5 per cent., and is therefore the best for technical purposes, as painting. Powdered gamboge, treated with æther and evaporated, leaves a resin which retains a certain portion of the æther, and has a glutinous

property which it only loses when exposed to a very high temperature. The qualities of the resin are those characteristic of an acid, and, indeed, those of a fatty acid. Its composition gives, as demonstrated, by consuming it with oxide of copper, this per centage composition :—

	I.	II.
Carbon	71.87	72.22
Hydrogen	7.06	7.41
Oxygen	21.07	20.37
	100.00	100.00

To determine the atomic weight of the acid, the salts of silver, lead, and barytes were subjected to analysis. The results were as follows :—

Salt of Silver	$C_{60}\ H_{35}\ O_{12} + Ag\ O.$
Salt of Lead	$2\ C_{60}\ H_{35}\ O_{12} + 5\ Pb\ O.$
Salt of Barytes	$4\ C_{60}\ H_{35}\ O_{12} + 3\ Ba\ O.$

Johnston found, in 100 parts of the resin of gamboge in the uncombined state :

Carbon	71,70
Hydrogen	7.03
Oxygen	21.27

Whence he calculated the formulæ, $C_{40}\ H_{23}\ O_9$ and $C_{48}\ H_{24}\ O_{10}$, which give, with the metallic oxides, results varying but little from those deduced from the above analysis.

After extracting the resin of gamboge by æther, the residue was digested in pure alcohol, the result of which was a glutinous substance, which on distillation left a glutinous brown extract, soluble in water, a property distinguishing it from the fatty acid extracted by æther. It exists but in very small proportions. The residue, remaining after the treatment of gamboge with æther and alcohol, when boiled in water, left only impurities of wood and sand mixed with the gamboge of commerce; whilst the solution, on account of its mucilaginous properties, would not pass through a filter. Diluted with water and drawn off by a syphon, the fluid was concentrated by evaporation. The gum thus obtained was digested and washed with spirit until it was nearly colourless, and dried at 100° C.; this yielded, when finely powdered, a yellowish white powder. By analysis he found its composition as follows :

	I.	II.
Carbon	44.00	44.94
Hydrogen	6.22	6.11
Oxygen	49.78	48.95
	100.00	100.00

From these analyses it follows, that this substance has the elementary composition of starch, or anhydrous sugar, as may be seen in comparing the annexed table.

	Gum of Gamboge.	Gum Arabic.	Starch or Anhydrous Cane Sugar.
Carbon	= 44.94	42.58	44.91
Hydrogen	= 6.11	6.37	6.11
Oxygen	= 48.95	51.05	48.98
	100.00	100.00	100.00

This composition led to the inference that the gum treated with nitric acid might be converted into mucic acid, or, by treating with dilute sulphuric acid, into sugar, an inference which experiments proved to be well founded.

Gamboge owes its colour to the fatty acid; with water it forms an emulsion, the water dissolving the gum, and a small quantity of a brown-red colouring matter, into a mucilage, in which the colouring matter is held in suspension. This examination finally proves, that the resin of gamboge resembles a fatty acid, that it contains a small quantity of a peculiar red-yellow colouring matter, soluble in water and alcohol, and a greater quantity of a gum-like substance, having the composition of flour of starch, which, by sulphuric acid, may be converted into sugar not capable of undergoing fermentation.

The analysis of two specimens of gamboge, given by Professor Christison to Professor Liebig, gave the following results:

	Analysis of No. I.	Analysis of No. II.
Fatty acid, soluble in æther	= 79.794	78.841
Colouring matter, soluble in alcohol and water	= 0.573	41.030
Gum	= 19.519	12.595
Residue	= 0.114	4.534
	100.000	100.000

The residue of No. II. consisted chiefly of particles of wood-dust and sand.

The specimen No. I. was labelled "Finest Siamese cane gamboge from Singapore, from a sample never met with in commerce."

No. II. was labelled "Ceylon gamboge, prepared for native commerce, but never met with in the commerce of Europe."

Annalen der Chemie und Pharmacie.

ATOMIC WEIGHTS AND EQUIVALENTS OF SIMPLE BODIES.

In publishing the following list of atomic weights we have been obliged, in many instances, to make a repetition on account of the divided opinions respecting them. There can be but little doubt that the new numbers, being so much more correct, will eventually be generally adopted; though at present, perhaps, the old numbers are in most general use. The evident alteration * taking place in the atomic weights renders annotations occasionally necessary. It appears, lastly, judicious from practical reasons alone (independent of all theories), to give a table of equivalents as well as of atomic weights.

That an equivalent in the case of H, Cl, Br, I, F, and so forth, is as much as a double atom, according to Berzelius, is well known.

NAMES OF BODIES.	SYMBOLS.	ATOMIC WEIGHTS.		EQUIVALENTS.	
		O = 100.	H = 1.	O = 100.	H = 1.
Aluminum *a*	Al.	171.167	27.432	171.167	13.716
Antimony	An. or Sb.	806.452	129.243	1612.904	129.243
Arsenic	Ar. or As.	470.042	75.329	940.084	75.329
Barium	Ba.	856.880	137.325	856.880	68.663
Bismuth *a**	Bi.	886.918	142.139	886.918	71.069
Boron	Bo. or B.	136.204	21.828	136.204	10.914
Bromine	B. or Br.	489.153	78.392	978.306	78.392
Cadmium	Cad. or Cd.	696.767	111.665	696.767	55.833
Calcium *b* (*Berzelius*)	Cal. or Ca.	256.019	41.030	256.019	20.515
(*Dumas, Erdmann, & Marchand*)	...	250.000	40.000	250.000	20.000
Carbon *c* (*Berzelius*)	Car. or C.	76.438	12.250	76.438	6.125
(*Liebig*)	...	75.850	12.140	75.850	6.070
(*Dumas*)	...	37.500	6.000		
(*Marchand and Erdmann*)	...	75.000	12.000	75.000	6.000
Cerium *d* (*Berzelius*)	Ce.	574.796	92.102	574.796	46.051
(*Beringer*)	...	577.000	92.928	577.000	46.464
Chlorine *e*	C. or Cl.	221.326	35.470	442.652	35.470
Chromium	Chr. or Cr.	351.815	36.382	351.815	18.191
Cobalt	Co.	368.991	59.135	368.991	29.568
Columbium, or Tantalium	Col. or Ta.	1153.715	184.896	1153.715	92.448
Copper	Cu.	395.695	63.415	395.695	31.707
Fluorine	F.	116.906	18.734	233.800	18.734
Glucinum, *f* (*Berzelius*), or	G. or	331.261	53.088	331.261	26.544
Berillium (*Awdejew.*)	Be.	58.084	9.308	58.084	4.654
Gold *g*	Au.	1243.013	199.207	1243.013	99.604
Hydrogen *h* (*Berzelius*)	H.	6.239	1.000	12.478	1.000
(*Dumas and Erdmann*)	...	6.250	1.000	12.500	1.000
Iodine	I.	790.460	126.567	1580.520	126.567

NAMES OF BODIES.	SYMBOLS.	ATOMIC WEIGHTS.		EQUIVALENTS.	
		O = 100.	H = 1.	O = 100.	H = 1.
Iridium	Ir.	1233.499	197.682	1233.499	98.841
Iron	Fe.	339.205	54.363	339.205	27.281
Lanthanium *i*	Lan. or La.	451.879			
Lead *k*	Pl. or Pb.	1294 498	207.458	1294.498	103.728
Lithium	Li. or L.	80.375	12.881	80 375	6.440
Magnesium	Mg. or Mag.	158.353	25.378	158.353	12.689
Manganese	Mn. or Man.	345.887	55.432	345.887	27.716
Mercury *l*	Hg.	1265.822	202.863	1265.822	202.863
Molybdemum	Mol. or Mo.	598.520	95.920	598.520	47.960
Nickel	Nic. or Ni.	369.675	59.245	369.675	29.622
Nitrogen, or Azote *m*	N.	88.518	14.186	177.036	14.186
Osmium	Os.	1244.487	199.444	1244.487	99.722
Oxygen *n* (*Berzelius*)	O.	100.000	16.026	100.000	8.013
(*Dumas and others*)	...	100.000	16.000	100.000	8.000
Palladium	Pal. or Pd.	665.899	106.708	665.899	53.359
Phosphorus	P.	196.143	31.436	392.286	31.436
Platinum	Pla or Pt.	1233.499	197.682	1233.499	98.841
Potassium, *o* or	Po. or	1237.5	99.		
Kalium	K.	489.916	78.515	489.916	39.257
Rhodium	Rh. or R.	651.387	104.392	651.387	52.196
Selenium	Se.	494.582	79.263	494.582	39.631
Silicium	Si.	277.312	44.442	277.312	22.221
Silver *p*	Ag.	1351.607	216.611	1351.607	108.305
Sodium, or Natrium	So. or Na.	290.897	46.620	290.897	23.310
Strontium	Str or Sr.	547.285	87.709	547.285	43.854
Sulphur *q*	S.	201.165	32.239	201.165	16.119
Tellurium	Tel. or Te.	801.760	128.500	801.760	64.250
Thorium	Th.	744.910	119.292	744.910	59.646
Tin	Sta. or Sn.	735.296	117.840	735.296	58.920
Titainum	Ti.	303.662	48.664	303.662	24.332
Tungsten, or Wolframium	Tu. or W.	1183.000	189.590	1183.000	94.795
Vanadium	Va. or V.	855.846	137.157	855.846	68.578
Uranium *r*	Urnm or U.	803.786	131.210	803.786	66.605
Yttrium	Yt. or Y.	402.514	64.508	402.514	32.254
Zinc *s*	Zn.	403.226	64.621	403.226	32.310
Zirconium	Zir. or Zr.	420.201	67.340	420.201	33.670

NOTES.

* Tending to obtain simple multiples of the atomic weight of hydrogen.

a Aluminum enters into no known combination but in two equivalents, and were it not for its analogy with peroxide of iron, its equivalent would be doubtful. This is also the case with zirconium. The equivalent of antimony, arsenic, and phosphorus is evidently a double atom.

*a** A dissertation by Werther proves that the Oxide of Bismuth is to be taken as Bi_2 O; therefore that the old number 1330.3 is again to be adopted, *Jacquelain Central Blatt*, 1838, p. 296.

b Central Blatt, 1842. p. 711. [The results of the experiments of Marchand and Erdmann in the investigation of the atomic weights of several simple bodies are given in an article on Atomic Weights, in the December

number of the PHARMACEUTICAL JOURNAL, p. 395, to which our readers are referred].

[*c See* article on Atomic Weights in PHARMACEUTICAL JOURNAL, December, 1842, p. 395].

d Central Blatt, p. 566. On account of the discovery of Didym by Mosander, this atomic number must remain in doubt. [Its probable number, according to Rammelsberg, is 572.8. *See* a short notice of the atomic weight of Lanthanium, in the Number for February, 1843, of PHARMACEUTICAL JOURNAL, page 544].

e Marignac has announced the equivalent of Chl. to be =450=36, but his more elaborate investigation (detailed in the *Annalen der Chemie und Pharmacie*, Band xliv., Heft 1) confirms the equivalent = 442.13 or 35.4. [Marchand and Erdmann find the numbers 450 = 36, *see* PHARMACEUTICAL JOURNAL for December, 1842, p. 395].

f Cf. Central Blatt, 1842, p. 631. Beryll=Be O.

g It is better in any case to take the equivalent of gold as double, or as =2486=199.2.

[*h See* PHARMACEUTICAL JOURNAL, December, 1842, p. 395, as this is one of the bodies examined by Marchand and Erdmann].

i According to Choubine. Rammelsberg found it to be 454.88. In consequence of the discovery of Didym, the number remains doubtful. *See* PHARMACEUTICAL JOURNAL for February, 1843, p. 544].

[*k* Marchand's and Erdmann's recent experiments give the result of 1300=104. for lead].

l Erdmann and Marchand are said to be about determining its atomic weight.

m Modern experiments appear to lead to the number 87.5 or the equivalent 175=14. If we reckon according to the specific weight of nitrogen (Dumas and Stas) we find 175.8 Svanberg (Jahresbericht 22) obtained from anhydrous nitrate of lead, as a mean, the number 174.37. [Marchand and Erdmann find the numbers 175=14].

[*n* The result of Erdmann's and Marchand's examination of this body, is Ox 100=8. *See* PHARMACEUTICAL JOURNAL, December 1842, p. 395].

o Marignac gives the atomic weight of potassium=490, therefore the equivalent 39.3. We expect further explanation of this. It will probably be generally assumed that potash is=K_2 O, in which case all the numbers will have to be divided.

p According to Marignac exactly 1350.00. [This number corresponds exactly with the result of the experiments of Erdmann and Marchand. *See* PHARMACEUTICAL JOURNAL for December, 1842, p. 395]. The number for Silver will probably be halved.

q Erdmann and Marchand are said to have fixed the atomic weight of Sulphur.

r According to modern experiments reckoned after the *Central Blatt*, 1842, p. 325. Peligot gives the equivalent 750.60, Ebelmen 742.875.

Most probably this number is to be halved.

s Jacquelain *Central Blatt*, 1842, p. 748, formed 414. Perhaps the equivalent 412.5=33 is correct.

[The preceding table is taken from the *Pharmaceutisches Central Blatt* for January 4, 1843. Some alterations have been made in the order of the substances to suit their English names ; additional symbols have likewise been given ; and some notes, contained within brackets, have been added. — ED. PHARM. JOURNAL.]

ON THE FORMATION AND CONSTITUTION OF SESQUICARBONATE OF SODA.

BY M. HERMANN.

The opinion once entertained that sesquicarbonate of soda is formed by boiling a solution of the bicarbonate, the latter giving up half an equivalent of carbonic acid, has already been refuted by M. Rose. This Chemist found that the solution of bicarbonate of soda disengages the whole of the second atom of carbonic acid, when exposed in a vacuum or to prolonged boiling.

The crystals of sesquicarbonate of soda cannot with any better success be obtained from a solution containing an equivalent of the carbonate and of the bicarbonate of that base. The conditions, therefore, under which the sesquicarbonate of soda may be formed, have hitherto remained unknown. M. Hermann thinks that he has found them. This salt is not formed by crystallization from an aqueous solution; in this way, it is decomposed into carbonate and bicarbonate of soda, which crystallizes separately; but it is easily formed, according to this Chemist, by efflorescence.

If, then, a concentrated solution of bicarbonate of soda be quickly heated, nearly to the boiling point, without allowing the second equivalent of carbonic acid to be entirely disengaged—if an equivalent of the bicarbonate and of the carbonate of soda be melted together in the water of crystallization of the latter, and the mass dried; or lastly, if the bicarbonate of soda be heated, without the temperature being allowed to rise above 390° Fahr., saline masses will be obtained, consisting chiefly of sesquicarbonate of soda. To obtain these in a crystalline state, they must be exposed for some time to the action of moist air; as, for instance, in a cellar. If, on thus exposing the mass, it be examined, after some weeks, it will be found with the absorption of water to have acquired a crystalline appearance.

The quantitative analysis of this salt shows, that the formula hitherto given of its constitution ($\dot{N}a_2\ \ddot{C}_3 + 4\dot{H}$) is not quite correct, but that its composition corresponds to the formula ($\dot{N}a_2\ \ddot{C}_3 + 3\dot{H}$).

One hundred parts were found to contain

Soda	40.00
Carbonic Acid	43.06
Water	16.94
	100.00

which gives

2 atoms	Soda	= 781.8	or	40.12
3 "	Carbonic Acid	= 820.2	"	42.56
3 "	Water	= 337.4	"	17 32
		1948.4		100.00

Journal für Praktische Chemie and Journal de Pharmacie.

TEST FOR NITRIC ACID.

M. Berthemot has discovered an easy method of determining the presence of nitric acid. About a drachm of concentrated sulphuric acid, free from nitric acid, is to be placed in a glass, to this is added a few drops of the liquid suspected to contain nitric acid. These are mixed together with a glass rod; and then with the moist extremity of the rod, a small piece of brucine is introduced into the mixture, and the whole stirred together. If nitric acid be present, a red colour will be immediately developed, which will afterwards pass to yellow ; if there be no nitric acid, the brucine will not dissolve. By this means, the presence of the $\frac{1}{10000}$ part of nitric acid may be detected in a liquid.—*Berzelius's Annual Report.*

DR. PARIS ON THE EDINBURGH PHARMACOPŒIA.

Objections have been taken to the language in which our Pharmacopœias have been hitherto written. It has been asked "for what purpose this national work is written in a dead language, not spoken in purity by any nation on the earth?" If not spoken, it is written and understood throughout the civilized world, and that cannot be said of any other language. An invalid travelling through many parts of Europe might die before a prescription written in English could be interpreted. But the truth is, that there unfortunately exists in the under-educated members of our profession a discontented spirit, which leads them to disparage, and carp at, whatever bears the stamp of learning;* and it is greatly to be regretted that the College of Edinburgh, to use a popular expression, should have so far yielded to this "*pressure from without*," as to have published their Pharmacopœia in the English language; or, I ought rather to say, their directions for compounding its several officinal preparations, for be it known that the articles of the materia medica still retain a Latin designation. And here we cannot but remark an inconsistency as grievous as that which disfigures their nomenclature. In every former pharmacopœia, the list of articles in its materia medica has been understood as being an enumeration of the drugs to be employed for the preparation of the officinal compounds; and, consequently, it has been the invariable rule, that the names of such ingredients as are introduced into the formulæ should exactly correspond with, and faithfully repeat, those of the same substances as they stand in the materia medica; but in the work before us, the articles appear in Latin in the list, and in English in the formulæ; and in some instances they differ even in their chemical denomination. In the formula for the preparation of "Ammoniæ Aqua et Ammoniæ Aqua Fortior," it is said, "Take of muriate of ammonia thirteen ounces," and so on; but in the very next formula for the preparation of Ammoniæ Carbonas, instead of muriate of ammonia, the direction is, "Take of *sal-ammoniac* one pound;" and if we turn to the materia medica, the term *sal-ammoniac* is not to be found: there is Ammoniacum, the English of which we are there told is *Ammoniac;* and this occurs in a pharmacopœia that professes to provide a luminous nomenclature. Again, as if the spirit of inconsistency were still unappeased, the editors, without any obvious reason, introduce the name of an ingredient sometimes in Latin, and sometimes in English; thus, for the preparation of "Antimonii Sulphuretum Præcipitatum," we have, "Take of *solution of potash*," &c., while, for that of "Linimentum Ammoniæ," we are directed to "Take of olive oil two fluid-ounces; *aqua ammoniæ* one fluid ounce." In the following instance, both English and Latin are blended together; in the class of alkalies there is a preparation termed "Ammoniæ Aqua Fortior," but when it is introduced in the formula for preparing the "Ferri Oxidum Nigrum," it is designated as *Strong* Aqua Ammoniæ. — *Pharmacologia, ninth edition, page* 105.

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* In adverting to this fact in my Supplement to the eighth edition, I gave great offence to a writer in the "Edinburgh Medical and Surgical Journal" by the following remark, and accompanying quotation from Palladius: "It is the character of the mischievous goose, '*improbus anser*,' to tear up by the root every thing it approaches, '*et morsu lædit et stercore.*' Perhaps cunning, more than folly, should be attributed to a class of persons who attempt to raise themselves by depressing everything around them, and that I might have therefore more aptly compared them to the fox in the fable, who, being without a tail, would persuade others to cut off theirs as a useless burthen.

REVIEW.

THE BENGAL DISPENSATORY, AND COMPANION TO THE PHARMACOPŒIA. By W.B. O'SHAUGHNESSY, M.D., *Professor of Chemistry and Materia Medica in the Medical College, Calcutta.*

THE Bengal Dispensatory has been written for the use of the students at the Medical College of Calcutta. It precedes the Pharmacopœia which is expected shortly to be published by order of the Bengal Government, and as a companion to which this work is intended. The author says, " It does not profess to be more than a compilation, for which the works specified* on the title-page, have afforded the chief materials, which he has re-arranged, commented upon, and added to, to the best of his ability."

The work embraces instructions on pharmaceutical manipulations, an outline of Chemistry, intended for the guidance of teachers of native Apothecaries; a grammar of Botany; a brief account of the mode of action of the several therapeutical classes of remedial agents; and the vegetable Materia Medica, arranged according to the natural system.

The limits of the work, 794 pages, have rendered it necessary to treat these, some of them comprehensive subjects, in a concise manner; but the work contains a great deal of valuable information for the class of readers for whom it is principally designed.

We propose inserting a few extracts in our next number respecting some of the articles of the Indian Materia Medica, which we think will be interesting to our readers.

TO CORRESPONDENTS.

WE have received the following formulæ for water-proof varnish:

T. G. E.—(For Boots) ℞ Roche Alum, ℥iv,
Acetate of Lead, ℥ij,
Gum Arabic, ℥j,
Water, ℥viij.

(For Hats) ℞ Shellac, ℔bviij,
Frankincense, ℔biij,
Borax, ℔bj,
Water, q. s. dissolve by boiling.

W. H. G.—(For Boots) ℞ Ceræ Flavæ, ℥ij,
Picis Aridis, ℥i.
Spiritus Terebinthinæ, ℥ij,
Olei Lini, ℔bj,
Olei Origani, ℥iv M.

W. BALLARD, Jun.— ℞ Linseed Oil, 8 parts
Boiled ditto, 10 parts
Suet, 8 parts
Yellow Wax, 8 parts. Mix with heat and apply to the boots.

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* Roxburgh, Wallick, Ainslie, Wight and Arnot, Royle, Pereira, Lindley, Richard, Feé.

An Associate enquires, if we could suggest any improvement in the preparation of the Plummer's pill of the Pharmacopœia, the quantity of treacle ordered being insufficient to form a pill-mass. A small quantity of water would, we presume, be the proper addition; in the formula of the Edinburgh College, the proportion of treacle is double that ordered by the London College, but the substitution of the Edinburgh formula would not be justifiable.

G. M. R.—Gold, silver and bronze inks, are made by mixing these metals in a state of fine powder, first with a small quantity of honey, and then with mucilage.

W. J. G in his observations on the bicarbonate of ammonia, is incorrect in supposing that part of the *ammonia* exists in a free state in the sesquicarbonate, and that the pungent smell of this salt arises from the liberation of ammoniacal gas. The sesquicarbonate of ammonia is supposed to consist of carbonate and bicarbonate, as the former of these may be separated from the latter either by solution with a very small quantity of water, or by exposure to the air. The bicarbonate has been used in medicine under the name of "mild carbonate of ammonia."

"Paul" enquires if we have noticed in making mistura cathartica, that the addition of spiritus ammoniæ aromatica renders the mixture solid. We we presume the fact arises from the decomposition of the sulphate of magnesia by the ammonia.

A. B. wishes to know the correct pronunciation of the word *quinine*. It is generally pronounced as if spelt *quenene*, after the French.

An Associate.—In making an emulsion add the alkali to a small quantity of the water, shake the bottle, add the oil, shake it again, add the remainder of the water, &c.

J. S. The sample has been received, it is very unlike Paregoric Elixir, and evidently not prepared according to the Pharmacopœia.

Mr. Frederick Smith recommends, as a method of preserving syrups, bottling them while hot in pints or quarts, and opening one at a time, *pro re natâ*.

Mr. Dicker (Plymouth) perforates glass of any thickness with a lead drill attached to his lathe, the drill having grooves cut from the point backwards, which are kept filled with coarse emery and oil.

W. H. C.—Naptha is a good solvent for Indian-rubber. *See* vol. ii., p. 465.

D. A.—The first question does not require an answer. Kreasote may be made into pills with crumb of bread.

"Inquisitor," and C. L. W. — Lotions and mixtures, containing a sediment or powder in suspension, should not be filtered without orders from the prescriber. In many cases the efficacy depends upon the substance so suspended.

Mr. Thomas Burdwood is referred to an article by Mr. Phillips, on Spiritus Ætheris Nitrici, in our last number.

"Alpha."—Griffin's Manipulation (price five shillings) answers the description. We cannot recommend any cheap work on Materia Medica.

E. H. and M. B.—We recommend Parnell's work on Chemical Analysis.

"An Associate, of limited means," enquires, Whether we advise him to take in the *Chemist?*—Yes.

H. P. advocates the closing of shops on Sunday. We advise each of our brethren to close his own shop without waiting for others to do the same.

"An Associate" (Liverpool).—Diluted acid should be used.

M. P. A.—R. D. C.—"Explorator."—"A.P.S." (Bristol), and "A.P.S." (Liverpool), make enquiries respecting admission into the Society, the answers to which would occupy at least a page, and possess no interest except to the parties concerned. Such questions we can only answer by post, for which purpose the names must be furnished.

H. recommends a scheme for preventing adulterations, and an interchange of price lists throughout the country. We think the plan impracticable and unlikely to answer, and would give reasons by post for this opinion, if H. would send his name and address.

A Member.—Any preparation sold with printed directions as a remedy for any disorder requires a stamp.

"A regular Reader." Several methods of making cloth water-proof are detailed in Dr. Ure's "Dictionary of the Arts and Manufactures."—The best amalgam for stopping teeth is that of gold leaf and mercury; it, however, requires to be made immediately previous to its introduction. A very good one may be prepared from the filings of *silver coin: pure silver* amalgam does not succeed, it remains soft.

A. P. S. Oxide of silver may be obtained by adding lime-water to nitrate of silver. For further particulars see any work on Chemistry.

J. S. S. The distillation of coal-tar is generally effected in iron stills with low heads, similar to that which is figured in Ure's "Dictionary of the Arts and Manufactures," p. 150. Ammonia is obtained from the ammoniacal liquor of the gas works, either by saturating the liquor with muriatic acid, and crystallizing the sal ammoniac thus formed, or by forming a sulphate of ammonia by the addition of gypsum. These salts are afterwards decomposed in the usual way.

"An Apprentice." The "Selecta e Prescriptis" is published by Highley, 32, Fleet Street.

M. P. (Newcastle.) One of the objects of the Pharmaceutical Society is to make a distinction between qualified and unqualified persons. We have reason to believe that this object will be gradually effected, and the Charter will tend to expedite this result, by giving stability to the Society, and influence to its members.

"An Associate" (Bath), enquires, What is the best method of preserving distilled waters from becoming sour? The vessels in which they are kept should be carefully cleansed, before a fresh stock is put in; and all distilled waters should be kept at a temperature as uniform as possible, and not exceeding 55° or 60° Fahr.

Y. Z.—"M. P. S." Spirit of wine 56° over-proof by Sikes's hydrometer is the rectified spirit of the Pharmacopœia. Proof spirit is made by mixing five pints of rectified spirit and three pints of distilled water, at the temperature of 62°.

"A Subscriber" sends a formula for marking ink, but we think it not so good as that published in our last number, p. 535.

Mr. Earland. Our space does not admit of our reprinting the article desired by Mr. Earland.

We have received communications from Mr. Southall and Mr. Woolley which we are obliged to defer until next month.

Advertisements to be addressed to Mr. Churchill, Princes Street, Soho.

Other Communications to The Editor, 338, Oxford Street (before the 20th of the month, if answers be desired in the ensuiug number).

PHARMACEUTICAL JOURNAL.

VOL. II.—No. X.—APRIL 1st, 1843.

THE CHARTER.

Among the various objections which were raised against the Pharmaceutical Society at the time of its formation, the only one of any importance was, that it possessed no Charter of Incorporation, and was not sanctioned or protected by the legislature. It was urged, that a private society could enjoy no stability, being dependent on the caprice of its supporters, and could exert but little influence over the body at large, on account of its jurisdiction being limited to within its own sphere.

In answer to these observations, we pointed out the fact, that no Charter of Incorporation could be expected until a society was established; and that whatever power or privileges we might hereafter obtain, must be earned by private and individual exertions in the first instance.

When we take into consideration the magnitude of the undertaking, and the difficulty of introducing a system of education and government among a body of men hitherto without any organization or unity of purpose, we may congratulate ourselves on our success in having obtained the sanction of Her Majesty within two years of the formation of the association.

In order to give a correct idea of the nature of the advantages conferred by the Charter, we subjoin, in a condensed form, some of its leading provisions, which, it will be seen, are in accordance with the principles hitherto acted upon by the Society. It is recited in the preamble, that the Society is established "for the purpose of advancing Chemistry and Pharmacy, and promoting an uniform system of education of those who should practise the

the same; and also for the protection of those who carry on the business of Chemists and Druggists; and that it is intended also to provide a fund for the relief of the distressed Members and Associates of the Society, and of their Widows and Orphans."

The present and future Members henceforth constitute "one body politic and corporate for the purposes aforesaid," "by the name of THE PHARMACEUTICAL SOCIETY OF GREAT BRITAIN, by which name they shall have perpetual succession, and a common seal;" and shall be able, "by the same name to sue and be sued, implead and be impleaded, answer and be answered unto," &c.; "and be for ever able and capable in the law to purchase, receive, possess, and enjoy, to them and their successors, any goods and chattels whatsoever," with the usual limitations.

The Charter provides, that "THE PHARMACEUTICAL SOCIETY OF GREAT BRITAIN shall consist of persons to be called Members thereof, and that such Members shall be Chemists and Druggists, who are or have been established on their own account, or who shall have been examined in such manner as the Council of the said Society shall deem proper, or shall have been certified to be duly qualified for admission as Members, or else shall be persons elected as Superintendents by the Council of the said Society; and all of which Members shall subscribe to the funds of the said Society, in such manner as shall be provided by the regulations thereof; and there shall also be admitted to all the privileges and benefits of the said Society, excepting the right of being present at the general meetings thereof, or of holding any office in the same, persons to be called Associates of the said Society, and such Associates shall be Assistants to Chemists and Druggists; also Apprentices or Students in Pharmacy and Chemistry; and such Associates, Apprentices, and Students shall first be duly examined in such manner as the Council of the said Society shall deem proper, and shall be certified to be duly qualified for admission thereto as Associates, Apprentices, or Students respectively, and shall subscribe to the funds of the said Society, in such manner as shall be provided by the regulations thereof."

The funds of the Society are under the management of the Council as before, subject to the by-laws; but "no sale or mortgage of any messuage, lands, tenements, or hereditaments belonging to the said body corporate shall be made, except with the approbation and concurrence of a general meeting of the Members of the said Society, specially convened for such purpose."

The Council has also the management of the examinations, the granting of Diplomas, the election of Honorary and Corresponding Members, the Benevolent Fund, and other affairs of the Society, subject to the by-laws.

The primary effect of the Charter is to confirm all that has been done by the PHARMACEUTICAL SOCIETY, to invest with some degree of authority, a body which has hitherto consisted of a voluntary association of individuals, and thus to remove the objection which was originally raised against a private and unrecognised Society. This is a step, and a very important step, towards the accomplishment of the object which we have in view—namely, the establishment of Pharmacy on a safe and creditable foundation as a branch of the medical profession.

It is necessary to bear in mind the difference between a Charter and an Act of Parliament. The Charter defines the limits and constitution of the body, on certain fixed principles, and in accordance with the existing state of the law; an Act of Parliament confers new powers, privileges, and immunities, which could not be obtained by Charter, although they could be granted only to a body, the constitution of which is fixed.

We have hitherto laboured under the disadvantage of possessing no collective influence, or professional character. When we have applied to other bodies for their support, or to the government for protection, we have been unable to define the limits of our body, or to separate ourselves from the amorphous group of unqualified persons, whose only pretensions to Pharmacy consisted in the display of a blue and a red bottle in their windows; and whatever privileges we might have obtained, could not have

been withheld from others, who are in no respect entitled to enjoy them. The distinction is now established and sanctioned on royal authority.

By the provisions of our Charter, our members are all recognized as Chemists and Druggists, and admission can, *in future*, only be granted to such as possess the proper qualification. Our diploma has become a legal instrument, and test of membership, and any person who should presume to imitate it, and arrogate to himself the rank of a member, without authority, would be liable to an injunction, and might be sued by the Society, by virtue of the Charter.

As an illustration of the influence possessed by corporate bodies, we need only advert to the answer which the Council of the PHARMACEUTICAL SOCIETY received from the College of Physicians (Nov. 27, 1841), when application was made for advice and assistance—namely, that "the College must have further time to consider how this may best be effected, with due attention to the privileges conferred by charter upon other bodies*."

Being now placed on a footing with these "other bodies," by the possession of a Royal Charter, we may claim as a right the same consideration on our behalf which has on that and other occasions been conceded to them. But it must not be supposed that because we have obtained our Charter, the work is accomplished. We are progressing gradually towards the establishment of a complete and effective system. We began by laying down a few *general principles* for our guidance, and organizing ourselves into a private association for the purpose of testing their value. These principles have been confirmed by experience and sanctioned by her Majesty, and we are therefore justified in assuming that they are approved by the Government; but we are still on the threshold of reformation, and it remains for us to apply our principles to practise in all their details.

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* See HISTORICAL SKETCH, page 83.

We are given to understand that the Secretary of State is preparing a Medical Bill, which will be brought into Parliament during the present session; and since we have so recently obtained a mark of distinction, implying the approbation of the Government, and also of the leading Members of the Profession, who have been consulted on the subject*, it is not at all likely that our claims to protection will be overlooked, provided we persevere in our present course. Even if we had not taken upon ourselves the regulation of our own body, it is evident that this would have formed an essential part of the measure about to be introduced, and it is no less certain, that unless we persevere until we have accomplished what we have undertaken, we may still be placed under the jurisdiction of others. It is universally acknowledged that an efficient examination of those who practice Pharmacy, is necessary for the protection and welfare of the public; and the question to be decided is, Whether this examination shall take place at the establishment of the Pharmaceutical Society, or elsewhere? We have no wish to depreciate or undervalue other bodies, but we would ask, Whether it would be creditable to our own to relinquish this prerogative, which ought to be vested in ourselves?

We have been repeatedly informed, that the proceedings and progress of the Society are narrowly watched by influential Members of the Profession, who will immediately interfere, if any evidence of inefficiency or lukewarmness, on our part, should be observed. It should, therefore, be our policy, not only to secure what we have already achieved, but also to obtain from the Legislature such powers and privileges as could not be conferred by Charter.

Some of our Country Members having lately proposed to reduce the subscription, a few remarks on this subject will not be out of place, as it is evident, that those who advocate this reduction

* See Historical Sketch, p. 106.

have not considered the matter in all its bearings,* and overlook the circumstances under which the institution originated. These circumstances have been so fully detailed from time to time in this Journal, that a recapitulation of them is unnecessary; we must, therefore, refer our readers to articles already published on the subject.†

We have seen, that in all the bills which have been proposed, in which the regulation of the Chemists and Druggists has formed a part, an annual payment for licence to practise Pharmacy ‡ has been contemplated, and this is the only method which is likely to be resorted to, for defraying the expenses of such a measure.

It is evident that an Institution directed by a Council chosen by and from among our own body, will not only be more honourable and satisfactory to ourselves, but also in its results more advantageous to the public at large, than a measure emanating from a different source, placing us under the control of others, and involving, in all probability, a much greater amount of expense. It is therefore desirable on all accounts that our own system should be adopted by the legislature, as the basis of future regulations, and that this will be the case, if we persevere in our present course, there is no reason to doubt, since the confirmation of a plan already arranged and found to work well, will relieve the Government from the perplexity and responsibility of contriving a new one.

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* At the time that the Druggists were associated for the purpose of opposing the objectionable clauses in the Act of 1815, no School of Pharmacy, Journal, or Benevolent Fund, were contemplated, yet the sum of two guineas was fixed upon as the amount of subscription. See HISTORICAL SKETCH, page 51.

† See PHARMACEUTICAL JOURNAL, VOL. I., pages 4, 35, 82, 210, 328, 439, 507, 511, 564, 633, 637. VOL. II., pages 113, 173, 313, 427, &c.

‡ See HISTORICAL SKETCH, pages 38, 41, 59, 66.

TRANSACTIONS
OF
THE PHARMACEUTICAL SOCIETY.

LECTURE I.

ON THE POLARIZATION OF LIGHT, AND ITS USEFUL APPLICATIONS.

BY JONATHAN PEREIRA, M.D., F.R.S.
Honorary Member of the Pharmaceutieal Society.

With the concurrence of the Council of your Society, I have undertaken to deliver three lectures on the Phenomena of Polarized Light. I have done so, because I believe that their singularity, variety, splendor, and useful applicability will create great and universal interest in the minds of my auditors, whatever be their pursuits, occupations, or acquirements.

I am acquainted with no branch of experimental philosophy capable of presenting such brilliant and gorgeous phenomena, and which are so well adapted for illustration in the lecture-room, as polarized light. In its power of unfolding to our view the intimate structure and constitution of natural bodies, it certainly has no superior, if indeed it have any equal. It furnishes us with characters for recognizing and distinguishing many bodies, and it gives us the means of determining the nature of the changes going on in some of the recondite operations of nature. It is a subject whose phenomena are so complicated and intricate, that it not only admits of, but actually requires, the highest departments of mathematics to elucidate them; and it is, therefore, very properly placed in the very first rank of the physico-mathematical sciences.

But in all societies and associations, the lovers of knowledge are of two kinds, philosophers and utilitarians. The first pursue science for its own sake, the second for its usefulness. With the latter every step they take in the acquirement of knowledge is accompanied with the question "*cui bono?*" With such, all scientific researches which have no immediately practical bearing, which, according to their narrow views, cannot be at once shown to be *useful,* are neglected, perhaps even sneered at. Though with such I profess to hold no community of feeling; yet as I am desirous of combining in these lectures, the *utile* with the *dulce,* I think I can venture to hold out to them ample remuneration for the time they may devote to the study of polarized light, by attending these lectures.

If I can show them that this agent furnishes us with a more intimate knowledge of the nature and properties of those substances, by the commerce in which most of the Members of this Society gain their bread; if I can demonstrate its applicability to the detection of adulteration of foods, drugs, and chemicals; if I can point out its application to the determination of the commercial value of saccharine juices; if I show how it has been applied to determine the nature of the changes which occur in certain chemical and vital processes, in which ordinary chemical analysis completely fails us; if I prove that it may aid members of my own profession in detecting the existence of certain diseases; and, lastly, if we show the possibility of its use to the mariner in aiding him, under certain circumstances, to avoid shoals and rocks—I trust even the utilitarians will admit that the study of polarized light is both advantageous and profitable, and that the time of this Society has not been unprofitably occupied by these lectures.

These are only a portion of the valuable and practical uses of which polarized light is susceptible. Its phenomena are so intricate, and at present so little understood by the public, that a very large number of persons, who might otherwise perhaps beneficially avail themselves of its services, are ignorant alike of its powers and of its uses. We may, therefore, hope that when it becomes better known it will be found more extensively useful.

Common and polarized light agree in several of their leading properties, and though these lectures are intended to illustrate the peculiarities of polarized light, yet before we can prove what is peculiar to the one, we must be acquainted with the general properties of the other, and thus, I conceive, I must introduce polarized light to your notice, by *a preliminary general view of the physical properties of light.*

Moreover, the phenomena of polarized light are so numerous, various, and intricate, that the student is very apt to become bewildered with an immense multitude of facts, and to forget, if indeed he ever knew, the conditions which are requisite for the production of each phenomenon. Hence, then, it becomes desirable that we should give him some artificial aid to assist in the conception of facts, and the modes of observing them; as well as to show him how these manifold phenomena are mutually connected and dependent. We require in fact some means of generalization. Such will be found, I think, in the *undulatory hypothesis of light.*

I propose, therefore, to occupy this lecture with a brief statement and demonstration of the properties of light, and to take a hasty glance at the hypothesis of waves or undulations; so that I trust you will leave this room to-night with some general notions

of the possible physical causes of common and polarized light; and almost anticipate some of the statements which I shall have to make in the next lecture.

1. GENERAL STATEMENT OF THE PHYSICAL PROPERTIES OF LIGHT.

1. *Propagation of Light.*—Light emanates from luminous bodies with the enormous rapidity of above 190,000 miles per second. This has been ascertained in two ways; first, by observation of the times at which the eclipses of the satellites of Jupiter are perceived by us at different seasons, according to the part of its orbit which the earth happens to be in; and, secondly, by the phenomenon called the aberration of the fixed stars. The first method gives 192,500, the second, 191,515 miles per second.

2. *Variation of Intensity.*—The intensity of light decreases as the square of the distance increases. At twice the distance, it has only $\frac{1}{4}$ of the intensity, at thrice the distance $\frac{1}{9}$ the intensity, at four times the distance $\frac{1}{16}$ of the intensity, and so on.

The reason of this is, that being highly expansile, it illuminates four times the space at twice the distance, nine times at thrice, and sixteen times at four times the distance; hence, its intensity must be inversely as the square of the distance.

The law is aptly illustrated by a quadrangular pyramid of wood, divided horizontally at equal distances, into four parts or segments of equal height. The upper segment has a square base, whose area we shall call 1. The second segment has also a square base, but its area is 4. The area of the square base of the third segment is 9, and that of the lowest or fourth segment, 16. Here the distances of the bases of the segments from the apex of the pyramid, are as 1, 2, 3, 4, while the areas of these bases are as 1, 4, 9, 16.

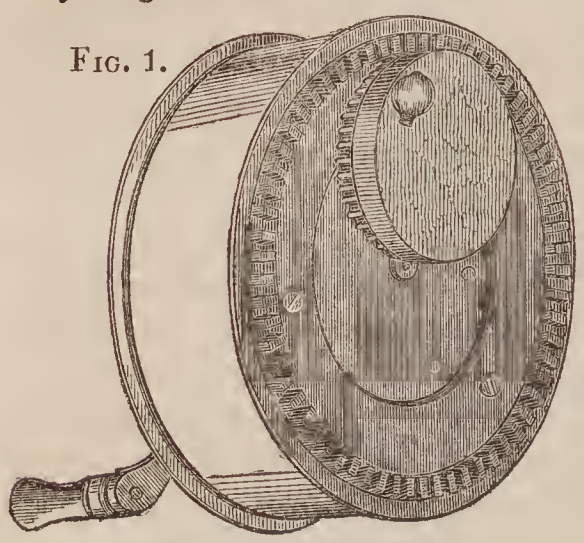
The readiest demonstration of the law for the lecture-room, is the following:—Let the light from a lantern pass out through a square aperture, and be received on a semi-transparent screen, on which square spaces are marked. Notice at what distance the beam of light illuminates one of these squares. At double the distance, it will illuminate 4, at treble 9, at quadruple 16 squares.

In *Photometry*, we avail ourselves of this law. If two luminous bodies, at unequal distances, produce the same amount of illumination, the relative quantities of light evolved by these bodies, are as the squares of the distances. Thus, if a lamp, at four feet distance, give as much light as a candle at one foot, the lamp actually evolves 16 times as much light as the candle. Count Rumford's photometrical process of observing at what distances two lights gave two shadows of equal intensities, as well as the photometers of the late Mr. Ritchie and of Professor Wheatstone, are on this principle. But all these modes of measuring light

are objectionable, since they are based on the imperfect and varying judgment of the eye.

Professor Wheatstone's recently-constructed photometer is a very ingenious contrivance. It is a cylindrical box, of about two inches diameter, and one inch in depth, and which contains a system of two wheels and pinions. On the face of the box, and near to its external border, is a circle of cogs. In the centre of the face is an axis, to which is attached an horizontal arm, carrying a toothed wheel or disk, the teeth of which fit into the cogs of the outer circle. This wheel has a double motion, it rotates on its own axis, and also revolves within the cogged circle. To this disk is attached a small, hollow, glass bead, silvered internally, and which moves with great rapidity backwards and forwards across the face of the cylinder. The motion is communicated by turning the handle on the opposite face of the box. If this photometer be placed between two lights, and the bead put in rapid motion, we observe two parallel luminous lines, about the $\frac{1}{10}$ of an inch apart. By adjusting the relative distances of the two lights from the photometer, so that the brightness of the luminous lines may be equalized as determined by the eye, and then squaring the distances, their comparative intensity may be ascertained*.

Fig. 1.



Wheatstone's Photometer.

3. *Transparency and Opacity.*—Some bodies allow light to penetrate them, as air, water, glass, crystal, &c. These are called *transparent* bodies. Others, however, refuse to give passage to light, as the metals. The latter are termed *opake* bodies. But some substances, which in the mass are opake, become transparent when reduced to thin films. Gold is an instance of this: in the lump it is opake, but as gold leaf it allows light to traverse it.

4. *Reflection.*—When a beam of light falls on a smooth-polished surface, a portion of it is *reflected.* The incident and the reflected ray make each the same angle with the reflecting surface, hence the law of reflection is, that *the angles of incidence and reflexion are equal.* This law holds good under all circumstances, whether the reflector be plain or curved.

A polished metallic plate as a *speculum* is a good reflector. *Glass*, being transparent, reflects both from its anterior and

* This instrument is made by Messrs. Watkins and Hill, of Charing Cross.

posterior surface. Hence in some optical experiments, where it is desirable to avoid the confusion from a double reflexion, the posterior surface of the glass is either ground, or blackened by means of soot, candle-smoke, or size and lamp-black. This proceeding is especially desirable in experiments on polarized light. *Silvered glass*, that is, glass covered on the posterior surface by an amalgam of tin, as the common looking-glass, is not adapted for accurate optical experiments, on account of the reflection from the metal as well as from the glass.

5. *Refraction.*—When a ray of light passes obliquely out of one medium into another of a different density or combustibility, it changes its direction, or is bent out of its course; in optical language it is *refracted.* If the second medium be denser, or more combustible than the first, the refraction is *towards* the perpendicular; but if the density or combustibility of the second medium is less than that of the first, the refraction is *from* the perpendicular.

If the ray fall perpendicularly on the refracting surface, it suffers no change in its direction, in other words, it undergoes no refraction.

In most optical instruments in which refracting media are required, *glass* is employed, as in the camera obscura, astronomical and terrestrial telescopes, microscopes, magic lanterns, common spectacles, eye-glasses, &c. The oxyhydrogen apparatus, which I shall use in these lectures for illustrating the phenomena of polarized light, serves, when deprived of its polarizing part, for use as a microscope (*oxyhydrogen* or *gas microscope*) the images of the objects being thrown on a screen. Used in this form, it is simply a refracting instrument. Its structure I shall hereafter explain. *Quartz* or *rock crystal* is used, under the name of *Brazil pebble*, as a refracting medium for spectacles, on account of its greater hardness, and its being less liable to scratch. The *diamond* and other precious gems have been occasionally used for microscopic lenses. Jewellers employ a *glass globe filled with water*, to concentrate the rays from the lamp which they use to work by. The water is generally coloured pale blue, to counteract the reddish yellow tint of the artificial light. *Amber*, when cut and polished, is sometimes used for spectacles. When the object is to concentrate rays of light, and to exclude those of heat, lenses of *alum* or *sulphate of copper* may be employed.

I have already stated, that the law of reflection, as regards the direction of the reflected ray, is the same for all reflecting media. But the law of refraction is very different, each refracting medium having its own peculiar action on light.

A variety of curious and well-known phenomena result from he unequal refracting powers of different bodies, or of the same

body in different states of density. Thus the apparent crookedness of a stick placed obliquely in water; the difficulty of hitting a body, as a fish, in water, when we take an oblique aim; the deception experienced in estimating the depth of water, except when viewed perpendicularly; and the altered position of a body (as a piece of money) contained in a basin, when viewed obliquely, first when the basin contains no water, and afterwards when water has been put in—these, and many other phenomena, result from the greater refractive powers of water than of air, and the consequent change of direction which the luminous rays suffer when passing from one medium to the other. Again, the tremulous motions of bodies, when viewed through an ascending current of heated air, and by which an excise-officer is said to have, on one occasion, discovered a subterranean still in the Highlands of Scotland, result from the unequal refracting power of air in different states of density.

6. *Dispersion.*—If a ray of white light be made to traverse a refracting medium, or, in other words, to suffer refraction, it is found to have undergone a remarkable change—it is no longer perfectly white, but more or less coloured. It is assumed, therefore, that white light is made up of coloured lights, and that these, being unequally refrangible, are separated, or, in optical language, are *dispersed.* In this way, seven colours are obtained, viz. *violet*, *indigo*, *blue*, *green*, *yellow*, *orange*, and *red.* These are usually procured by a triangular piece of glass, called a *prism*—the seven colours constituting the *prismatic* or *solar spectrum.* This mode of producing colours from white light is called the *decomposition*, the *analysis*, or the *dispersion* of light. If we allow the oxyhydrogen lime-light to pass out of the lantern through a slit, and receive it on a prism, the spectrum may be thrown on the cieling of the lecture-room, or on the screen before us.

To persons unacquainted with philosophical investigations, few facts seem more astonishing, and even improbable, than that of *white* light being compounded of differently *coloured* lights. I shall, therefore, dwell for a few minutes on this topic.

Every one is familiar with the fact, that, by mixture, colours are altered. Thus blue and yellow form *green;* red and yellow form *orange;* while blue, with different proportions of red, yields *indigo* or *violet.*

You will, therefore, readily believe, that of the seven prismatic colours into which the prism decomposes white light, three only may be primitive, and four compounded.

Primitives.	*Compounds.*
Red	Orange
Yellow	Green
Blue	Indigo
	Violet

If the seven prismatic colours be rudely printed on a circular disk of card, and then be made to rotate rapidly, the union of these colours on the retina gives us an impression of greyish-white.

If we paint the three supposed primitive colours, viz., red, yellow, and blue on a similar disk, and cause this to revolve, we also obtain an impression of greyish white.

These experiments, therefore, favour the notion that the sensation of white light depends on the simultaneous impression of differently-coloured lights on the retina; and, secondly, that three of the prismatic colours being capable of giving the sensation of white light, they probably are the primitive colours, the others being compounds. Hence, white light is called *compound* or *heterogeneous light;* while the three colours, red, yellow, and blue, are termed *simple* or *homogeneous lights.* Each of these may be termed a *monochromatic light.* Orange, green, indigo, and violet, on the other hand, are *mixed colours.*

It follows, from this view of the subject, that two colours (one of which must be *mixed*) may by their union or mixture produce white light. Colours or tints which do this are called *complementary.*

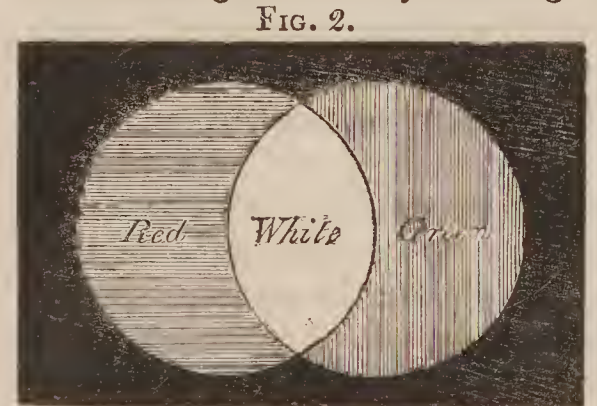
Complementary Tints.

Red ... and Green.
Yellow " Indigo.
Blue... " Orange.

White and *black* are also said to be complementary.

I shall now proceed to demonstrate the accuracy of these positions. If I throw two beams of coloured light, one red, the other green, on a screen, we see two circular disks of coloured light, and by making them overlap, they produce white light. A similar result (that is, the formation of white light) is also produced by the overlapping respectively of disks of indigo and yellow, and of blue and orange. These colours are obtained by a complicated process. The oxy-hydrogen lime-light is refracted by the *condensers* in this lantern — then polarized — then doubly refracted or depolarized by a thin film of selenite—then refracted by the two *powers*—then analysed by a double refracting prism.

Fig. 2.



Formation of White Light.

By this process, the nature of which will be fully explained hereafter, we have destroyed the yellow and the blue, leaving the *red,* of one beam—while the red only has been destroyed in the other beam, leaving the *yellow* and the *blue* (which by their mixture constitute *green*). If we then cross the two beams, the red and the green by their mixture form white light.

The position of the orange or green lights in the spectrum favours the notion of their being mixed colours; since the orange is placed between the red and the yellow, and the green between the yellow and the blue.

But the indigo and the violet being placed the most remote from the red, appear to present an obstacle to this notion. Dr. Brewster, who adopts the supposition of there being three primitive colours, supposes that the solar spectrum consists of three spectra of equal lengths, a red, a yellow, and a blue one; and that the position of the maximum intensities of these colours varies, while certain portions of each of the three colours form white light, by mixing with the other colours in the requisite proportions—the excess of colour giving the predominating tint to that part of the spectrum where it exists. Thus in the red part of the spectrum, there is an excess of red rays, in the yellow part of yellow rays, in the blue part of blue rays, in the violet part of both blue and red rays.

This view of the subject has never appeared to me satisfactory; and accordingly another and a more probable one presenting itself, I am inclined to adopt it, more especially as it is supported by some experiments recently made by Sir John Herschel*. Suppose a repetition of the primitive colours of the Newtonian spectrum; the red of the second spectrum being partially superposed on the blue of the first spectrum. The extreme blue rays of the first spectrum being intermixed with the red rays of the second spectrum, will give the sensation of indigo and violet. But it may be asked, where are the other colours of the second spectrum? The reply is, that they are not visible to the eye. What evidence, then, it will be said, is there of the existence of invisible rays beyond the first or Newtonian spectrum? The evidence is twofold—first, the well-known chemical effects produced beyond the visible spectrum; and, secondly, Sir John Herschel's experiments before referred to. In his first paper†, in which he announces the extension of the visible prismatic spectrum, and the existence of a new prismatic colour beyond the violet; he states, that this colour appeared to his eyes as well as to those of a friend, to be lavender-grey. But in a more recent paper‡, he appears to have satisfied himself that the colour is yellow. "And if such," he adds, "rather than lavender or dove colour, should be the true colorific character of these rays, we might almost be led to believe (from the evident reappearance of redness mingled with blue in the violet rays) in a repetition of the primary tints in their order,

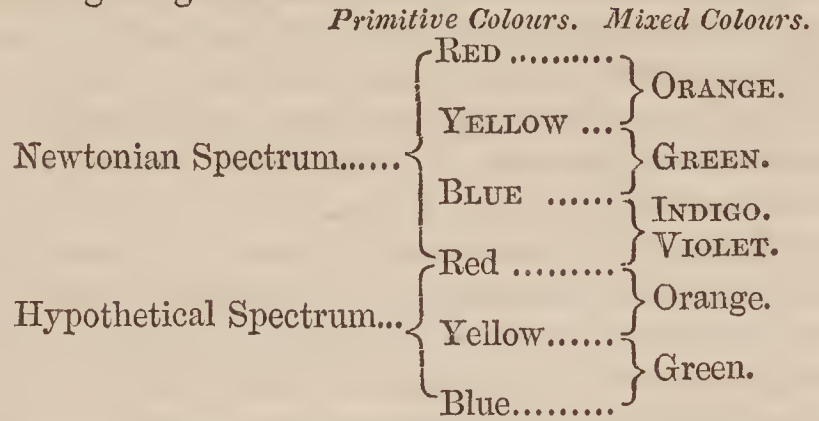
* This notion was thrown out by Professor Grove, in his Lectures on Light, delivered at the London Institution, in November, 1842.

† *Philosophical Transactions*, for 1840, p. 19.

‡ *Ibid*, for 1842, pp. 195, 196.

beyond the Newtonian spectrum, and that if, by any concentration, rays still farther advanced in the chemical spectrum could be made to affect the eye with a sense of light and colour, that colour would be green, blue, &c., according to the augmented refrangibility."

The following diagram serves to illustrate this view:



There are many interesting topics connected with the spectrum, the details of which I feel precluded from entering into, inasmuch as these lectures are intended to illustrate the phenomena of polarized light. I must, therefore, content myself with briefly naming some of them. The first is the *unequal refrangibility* of the different-coloured rays; the red being the least, the violet the most refrangible. It is in virtue of this property that lenses and prisms produce the phenomena of *dispersion* or *chromatic aberration*. Newton thought that the size of the spectrum, or the dispersive power of the refractive medium, was proportional to its refractive power; and, therefore, that the refracting telescope could not be made *achromatic*. In this he was mistaken. Equal refractions do not produce equal dispersions. Two lenses made of different kinds of glass, as one of crown the other of flint glass, may be so ground that the dispersions shall neutralize each other, while their refractions, not being equal, cannot neutralize; consequently, an excess of one remains.

Not the least remarkable fact connected with the spectrum, is the existence of *bands* or *fixed lines* in it. They are commonly called *Fraunhofer's lines of the spectrum*. The best mode of seeing them is to examine the spectrum by a telescope*. The light (as of a lamp, or that produced by throwing the oxyhydrogen flame on lime) should be passed through a bottle filled with nitrous acid vapour before it falls on the prism, to produce the spectrum.

The illuminating, heating, magnetic, and chemical powers of the spectrum, I must pass over without further notice, as they have no direct connection with the immediate object of this course of lectures. I cannot resist, however, remarking that the

* An apparatus for the exhibition of these lines, lent by Messrs. Watkins and Hill, was exhibited to the meeting.

existence of a calorific, magnetic, and chemical influence beyond the confines of the coloured spectrum, is a fact of considerable importance in any enquiries which may be instituted into the nature of light. Moreover, the splendid and interesting pictures called *Daguerreotypes*, *Calotypes**, *Chrysotypes*, and *Ferrotypes, or Cyanotypes*, now before me, produced by the chemical influence of light on gross or ponderable matter, show the high importance of investigations respecting the chemical powers of the spectrum.

7. *Diffraction.*—When light passes near the edges of bodies, it suffers certain modifications, included by opticians under the denomination of *inflection* or *diffraction.* If an opake body be placed in a cone of light admitted into a dark chamber through a very small aperture, its shadow is larger than its geometric projection. Moreover, its shadow is bordered with fringes, and similar fringes are observed within the shadows of narrow bodies.

If the light be homogeneous or monochromatic, the fringes consist of dark and light spaces of the same colour, and are of different breadths, red yielding the broadest, violet the narrowest fringes, but in white light the fringes are prismatic or iris-coloured.

The iris fringes may be readily observed by looking through the slit, between the almost closed fingers, at a candle, placed at a distance of several yards. It may be seen still better by looking at the same luminous body through a feather, or through a fine wire gauze. I have before me Schwerd's very complete apparatus for examining the complicated and difficult phenomena of diffraction.

When I tell you that the immortal Newton failed to perceive the internal fringes, and that he left the subject altogether in an imperfect, unsatisfactory, and unfinished state, I need scarcely add, that the phenomena are very complicated, and their study exceedingly difficult.

8. *Colours of thin plates, of films, and of grooved surfaces.* A variety of curious and brilliant optical phenomena were attributed by Newton to what he called *fits of transmission*, and *fits of reflection;* but which Dr. Young and most subsequent writers ascribe to *interference of light.* I refer now to the *phenomena of thin plates, of films, and of grooved surfaces.*

Excessively thin plates of air, liquids, or solids, appear coloured when viewed by reflected and transmitted light; but the colour seen by reflection is complementary to that seen by transmission.

If the plate be of uniform thickness, the colour is uniform; but if the thickness varies, the colour also varies.

* Some beautiful Calotype portraits, taken by Mr. Collen, of Somerset Street, Portman Square, miniature painter to the Queen, were exhibited to the meeting.

Very much thinner plates than those which present colours, do not reflect light, and when viewed in this position, appear black. But they still transmit light, and when viewed by transmitted light, appear white.

Wedge-shaped plates present a series of parallel bands or fringes of colour.

A plate having the form of a plano-concave lens, the thinnest part of the plate being in the centre, gives a series of concentric rings of brilliant colours. Those seen by reflected light, have a black spot in the centre, while the transmitted rings have a white spot in the centre.

These different phenomena of thin plates are brilliantly illustrated in the lecture-room by the oxyhydrogen lime-light, which, after passing through the condensers of the lantern, is polarized, then passed through films of selenite (of uniform thinness, or wedge-shaped plates, or plano-concave films) afterwards through the two lenses called the powers, and ultimately analysed by a plate of tourmaline, or a bundle of plates of thin glass. The nature of the changes will be explained hereafter.

The squares of the diameters of the reflected coloured rings are as the odd numbers, 1, 3, 5, 7, 9, &c.; while the squares of the diameters of the transmitted rings are as the even numbers, 2, 4, 6, 8, 10, &c.

The brilliant colours, produced by thin plates of air between the laminæ of mica, of selenite, and of Iceland spar, and between plates of glass, are familiar illustrations of the colours caused by thin plates of a gaseous substance.

The colours caused by thin films of oil of turpentine or other essential oils, of alcohol or of water, and by soap-bubbles, are well-known examples of the colours caused by thin plates of liquids.

The iridescent hues produced on copper or steel by heat, and which depend on the formation of a thin film of metallic oxide, are good illustrations of the colours caused by thin plates of solids. But the most brilliant are those caused by thin films of peroxide of lead, formed upon polished steel plates, by the electrolytic decomposition of acetate of lead. These splendid prismatic tints were discovered by Nobili*, and are commonly known as *Nobili's colours* or *metallo-chromes*. The mode of producing them has been described by my friend Mr. Gassiot, in a paper read before the Royal Society†. If we place on the polished steel plate a card screen in which some device is cut out, very beautiful figures, having a splendid iridescent appearance, are produced.

In all the cases hitherto alluded to, I have supposed white or

* See Taylor's *Scientific Memoirs*, vol. i. part 1.

† See the *Proceedings of the Royal Society*, for March, 1840; also Brande's *Manual of Chemistry*, 5th edit., p. 836.

compound light to be used; and then the colours are iridescent or prismatic. But if monochromatic or homogeneous light be employed, the rings are of a uniform tint or colour, and are separated by obscure bands or rings. Red light yields the broadest, violet light the narrowest rings.

Minute particles, fibres, and grooved surfaces also produce prismatic or iridescent colours by white light. Thus, minute particles of condensed vapour, obtained by breathing on glass, give rise to this effect. A familiar illustration is to be found in the halos observed around the street-lamps, when viewed at night through a coach-window, on the glass of which vapour is deposited. In this case the colours are seen by transmission. Dr. Joseph Reade's beautiful instrument, called the *Iriscope*, brilliantly displays the colours produced by reflection from a plate covered with condensed vapour. It consists of a plate of highly-polished black glass, having its surface smeared with a solution of fine soap, and subsequently dried by rubbing it clean with a piece of chamois leather. If the surface, thus prepared, be breathed on, through a glass tube, the vapour is deposited in brilliant coloured rings. But as, in this mode of experimenting, the plate of vapour is thickest in the middle, and thinnest in the circumference, the rings have black circumferences instead of black centres.

Minute fibres of silk, wool, and of the spider's web, also present in sunshine a most vivid iridescence.

A very minutely grooved surface also presents a prismatic or iridescent appearance in white light. Of this mother-of-pearl is a familiar instance—as also opal. Micrometer scales frequently present the same appearances; and Barton's buttons and other iris ornaments owe their resplendence to the numerous minute grooves cut in the surface of the metal. If a beam of light from the oxyhydrogen apparatus be received on one of Barton's buttons, an iridescent image may be thrown on a screen several yards distant; thus furnishing a good lecture-room illustration of the colours of grooved surfaces.

9. *Double Refraction.*—When a pencil of light falls in certain directions on any crystals, which do not belong to the cubical system, it is split or divided into two other pencils, which diverge and follow different paths; and when their divergence is considerable, objects viewed through them appear doubled. The change thus effected on a ray of light is denominated *double refraction.* The substance which is commonly used to produce this effect is that variety of transparent crystallized carbonate of lime, called *Iceland spar*, or sometimes *calcareous spar*, or, for brevity, *calc-spar.*

In every double refracting crystal there are, however, one or more directions in which double refraction does not take place. These are called *axes of double refraction:* they might with more propriety be termed *axes of* NO *double refraction.*

I now pass a beam of light (produced by throwing the oxy-hydrogen flame on lime) through a rhombohedron of Iceland spar, and we obtain two images on the screen. By rotating the crystal on its axis, one of the images revolves around the other, but does not disappear. Now this fact proves that the light which falls on the crystal is unpolarized. If it had been polarized, one image would disappear in certain positions.

10. *Polarization.*—When submitted to certain influences, the rays of common light acquire peculiar properties, designated by the term *polarization*. These peculiarities are not distinguishable by the unassisted eye.

A very common question, put by persons who have not studied the subject, is, "*What is polarized light?*" and the philosopher feels very considerable difficulty in giving a concise and intelligible reply; so that the enquirer, perhaps after listening to a lengthened detail, frequently goes away, without getting as he says, a direct and short answer to his question.

There are two modes of reply: *one* is to describe, independent of all hypotheses, the properties by which polarized light is distinguished from common light; the *other*, is to adopt some hypothesis of the nature of light, and, therefore, to give an hypothetical explanation of the nature of polarized light. Whichever method we adopt—and I shall give both—lengthened details are necessary to enable the uninitiated to comprehend the subject.

There are four methods of polarizing light, *viz.*

a. Reflection.
b. Simple refraction.
c. Double refraction.
d. Transmission through a plate of tourmaline.

In the following table I have contrasted some of the distinguishing characteristics of common and polarized light:

A Ray of Common Light,	*A Ray of Polarized Light,*
1. Is capable of *reflection*, at oblique angles of incidence, in every position of the reflector.	1. Is capable of *reflection*, at oblique angles of incidence, *in certain positions only* of the reflector.
2. Penetrates a plate of *tourmaline* (cut parallel to the axis of the crystal) in every position of the plate.	2. Penetrates a plate of *tourmaline* (cut parallel to the axis of the crystal) in certain positions of the plate, but in others is wholly intercepted.
3. Penetrates a *bundle of parallel glass plates*, in every position of the bundle.	3. Penetrates a *bundle of parallel glass plates*, in certain positions of the bundle, but not in others.
4. Suffers *double refraction* by Iceland spar in every direction, except that of the axis of the crystal.	4. Does not suffer *double refraction* by Iceland spar in every direction, except that of the axis of the crystal. In certain positions, it suffers single refraction only.

Thus, then, one mode of replying to the before-mentioned question would be, by recapitulating the facts stated in this second column. This reply would form what I may term a matter-of-fact answer, being independent of all hypothesis.

The naked or unassisted eye cannot then distinguish common from polarized light. Every person must have repeatedly seen polarized light, but not knowing how to recognize it, has failed to distinguish it from common light. If you look at a polished mahogany table, placed between you and the window, part of the light reflected from the table is polarized. When you look obliquely at the goods in a linendraper's shop, through the plate-glass window, part of the light by which you see the articles is polarized. When you see two images by a crystal of Iceland spar the transmitted light is polarized. The atmospheric light is frequently polarized, especially in the earlier and later periods of the day when the solar rays fall very obliquely on the atmosphere. At the present season, the effect may be perceived at eight or nine o'clock in the morning and five or six o'clock in the afternoon, the observer standing with his back to the sun, or with his face north or south. I have found that the effect is best perceived when the sun is shining, and the atmosphere more or less misty.

It is obvious, therefore, that after we have polarized a ray of light, we must employ some agent to detect its peculiar properties. This agent is called the *analyser*. It would be better understood if it were termed the *test*. It may be a *reflecting plate, a plate of tourmaline, a bundle of glass plates, a Nichol's prism*, or *a double refracting prism;* in fact, the analyser or test must be a polarizer.

Thus, then, a *polariscope* consists of two parts: one for polarizing, the other for analysing or testing the light. There is no essential difference between the two parts, except what convenience or economy may lead us to adopt; and either part, therefore, may be used as polarizer or analyser; but whichever we use as the polarizer, the other then becomes the analyser.

a. Polarization by reflection.—This method of polarizing light was discovered by Malus, in 1808. He was viewing, through a double refracting prism, the light of the setting sun reflected from the glass windows of the Luxemburgh palace in Paris; and, on turning round the prism, he was surprised to observe a remarkable difference in the intensity of the two images: the most refracted alternately surpassing and falling short of the least refracted in brightness.

Polarizing reflectors are usually *glass*. This should be either ground or blackened at the back to prevent posterior reflection. *Water* is seldom made use of. *Mica* may be employed instead

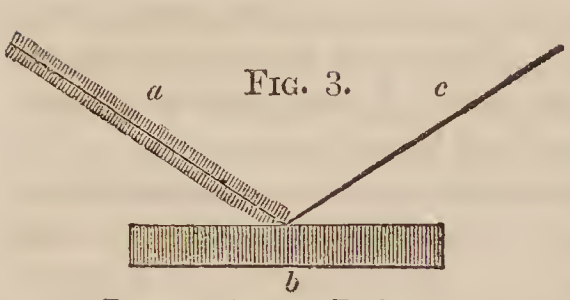


FIG. 3.

Polarization by Reflection.

a. Incident ray of common or unpolarized light.
b. Plate of glass *(polarizing plate)*.
c. Reflected ray of polarized light.

of glass. *A well-polished* or *varnished piece of wood* (as a table, top of a pianoforte, or a counter) is very convenient. *Marble* also answers tolerably well. The *shining back of a book* is oftentimes serviceable. Metallic plates are objectionable; since by one reflection only from them, the light is found to be elliptically polarized; though by successive reflections it becomes plane polarized.

The polarizing angle varies for different substances, as the following table shows:

Angles of Polarization by reflection.

Water . . .	52° 45′
Glass	56° 45′
Sulphate of lime	56° 45′
Rock crystal .	56° 58′
Iceland spar . .	58° 51′
Diamond . . .	68° 1′

From a very extensive series of experiments, made to determine the maximum polarizing angles of various bodies, Dr. Brewster arrived at the following law: *the index of refraction is the tangent of the angle of polarization.* It follows, therefore, that *the reflected polarized ray forms a right angle with the refracted ray.*

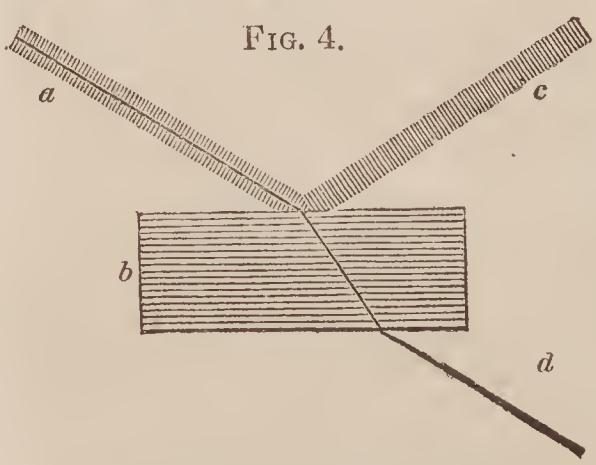
Here, perhaps, is the most convenient place for referring to a suggested application of polarized light. I have stated that light is polarized by water, at an angle of 52° 45′. By the analyser (as a tourmaline, or Nichol's prism, or a bundle of glass plates) the whole of this reflected polarized light may be intercepted without offering any impediment to the unpolarized but refracted light which has traversed the water; so that objects may be more readily seen at the bottom of ponds, rivers, and the sea, by this expedient than otherwise, since the glare of the reflected light is prevented. Hence anglers, and those fond of fish-spearing, may employ this property of polarized light in the discovery of the objects of their sport; and commanders of vessels may avail themselves of it to detect rocks and shoals in the bottom of the ocean, which are not otherwise visible except by viewing them from the mast-head, by which the angle of reflexion is diminished, and consequently the quantity of light reflected is thereby lessened.

I proceed now to demonstrate the polarization of light by reflection, and the essential properties of the polarized ray. For this purpose, I obtain an intense light by throwing the flame of a jet of mixed oxygen and hydrogen gases on a cylinder of lime.

This light, which I shall, for brevity, call the *lime-light*, is condensed by two crossed lenses (called *condensers*), and thrown on a plate of glass, blackened at the back, and placed at an angle of 56° 45′. The light is polarized by this plate, and being then refracted by two plano-convex glasses (termed the *powers*), is afterwards received on a semi-transparent calico screen, strained on a wooden frame, and moistened with water.

The light thus polarized is not distinguishable by the eye from common light, but to prove its nature, I proceed to test it. For this purpose, I place a plate of tourmaline on the front of the polariscope, and on revolving this plate, you observe the light on the screen is alternately cut off and admitted. At 0 the tourmaline transmits the light, at 90° it absorbs it, at 180° it transmits it, at 270° it absorbs it. I remove the tourmaline, and substitute a bundle of glass plates, placed at an angle of 56° 45′. On revolving this, the light is observed to be alternately cut off and transmitted, as in the case of the tourmaline. I now substitute a double refracting prism for the bundle of glass, and on revolving this, it is seen that in two positions double refraction takes place, and two images are produced on the screen, while in two intermediate positions, one image is cut off. Thus, then, the light reflected from the blackened glass plate of the polariscope, is polarized, since it possesses the characters assigned to this kind of light.

Fig. 4.



Polarization by single Refraction.
a. Ray of common or unpolarized light.
b. Bundle of glass plates.
c. Reflected polarized ray.
d. Refracted polarized ray. This ray is oppositely polarized to *c*.

2. *Polarization by single Refraction.*—If light be transmitted obliquely through a bundle of diaphanous laminæ, it suffers polarization. The very thin parallel glass plates used for microscopes, and sold by Bromley and Drake, at 315, Oxford Street, form the best medium. Sixteen of these are to be placed side by side, and the bundle then placed at an angle of 56° 45′ to the ray to be polarized.

Common crown or window glass serves well enough for ordinary purposes. The flattest, thinnest, most colourless, and perfect pieces are to be selected. A very convenient mode of using them is the following:—Take two one ounce paper pill-boxes, remove the lids and the bottoms, and then paste together the two cylinders of the boxes, so as to form a tube. Into this, place obliquely sixteen pieces of window glass. Having cut in each of the lids a circular hole, of about the size of a sixpence, place a lid at each end of the cylinder.

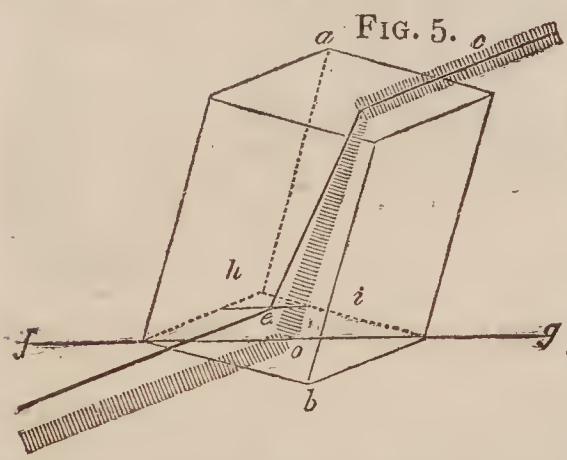
The light by passing obliquely through the glass-plates in this cylinder, becomes polarized.

A bundle of mica plates may be used for polarizing, but it is inferior to the bundle of microscope glass above referred to.

3. *Polarization by Double Refraction.*—I have already demonstrated the double refractive power of Iceland spar; though I have not hitherto said anything of the nature of the light of which the two pencils are made up.

I now proceed to demonstrate that the two pencils or rays produced by this process are polarized; but the polarized state of the one ray is of an opposite kind to that of the other; so that the two rays are said to be *oppositely polarized*. That this is the case is proved by applying our tests to them. Thus, if I apply a plate of tourmaline, you observe that, as this is rotated, one of the luminous rays is alternately cut off, which would not be the case were the rays composed of common light; while, if both were similarly polarized they would be simultaneously and not alternately absorbed. If I substitute the bundle of glass plates for the tourmaline, one of the rays is reflected, and the other transmitted; and by revolving the bundle 90°, the ray which was reflected is now transmitted, and that which was transmitted is now reflected.

FIG. 5.



Double Refraction by a rhombohedron of Iceland Spar.

a. b. The obtuse angles. A line drawn from *a* to *b* represents the axis of the crystal.

c. Incident ray of unpolarized or common light.

e. o. Oppositely polarized transmitted rays, *e* is called the extraordinary, *o* the ordinary ray.

f. g. A line, which when viewed through the rhombohedron, appears doubled, *f g* and *h i*.

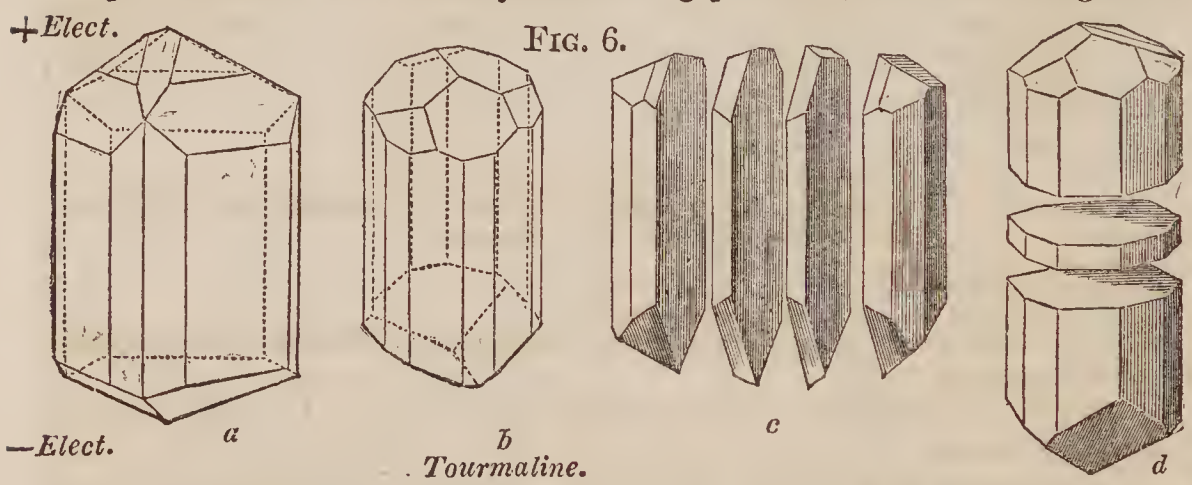
Nichol's prism, or *Nichol's eye-piece**, is a most valuable and convenient polarizer. It is an oblique rhombic prism, whose terminal planes form an angle of 68° with the adjoining obtuse lateral edges. It is formed by joining, by means of Canada balsam, two wedge-shaped pieces of Iceland spar. It is a double refractor, but the two rays are made to deviate so far, that only one image is seen in its usual position. The cause of this is the Canada balsam, whose index of refraction (1.549) is intermediate between that for the ordinary ray (1.654), and that for the extraordinary ray (1.483), so that this substance changes the direction of the two rays in an opposite manner, before they enter the posterior half of the prism. Over the tourmaline this prism has the advantage of being perfectly free from colour, but it has the great objection of giving a very limited field of vision.

* See *Jameson's Journal*, vols. 6, 16, and 27.

4. *Polarization by the Tourmaline.* The last mode of polarizing light to which I shall have occasion to allude, is by transmitting it through a plate of tourmaline, cut parallel to the axis of the crystal.

The substance called *tourmaline*, and to which I have already referred, is a precious stone, which is occasionally cut and polished, and worn as a jewel. There is good reason for supposing that it is the substance to which Theophrastus alludes under the name of *lyncurium* (λυγκύριον). It is found in various parts of Europe, Asia, Africa, and America. Much of that found in commerce comes from the Brazils. It occurs in thick and short, as well as in acicular prismatic crystals, belonging to the rhombohedric system, and which have three, six, or more sides and dissimilar summits. Thus in most tourmalines the extremities or summits of the crystal differ from each other in the number or situation of the planes; and like other unsymmetrical crystals, the tourmaline becomes electrical while changing its temperature, one extremity becoming positive, the other negative.

FIG. 6.



a. Brazilian tourmaline. By cooling, the upper end becomes positively (+), the lower negatively (—) electrical.
b. Another tourmaline.
c. Tourmaline slit, parallel to the axis, into four plates, which, when ground and polished, are used as either polarizers or analysers.
d. Tourmaline cut at right angles to its axis. The plates, thus obtained, are ground and polished, and then used in the polariscope for producing coloured rings.

The colour of the tourmaline is various, but green and brown are the prevailing tints. Curiously enough, there appears to be a remarkable connection between the colour and the other optical, as well as the electrical properties of the tourmaline. Green, blue, and yellow colours are, in general, imperfect polarizers. The brown and pinkish tints are the best. White colourless tourmalines do not polarize.

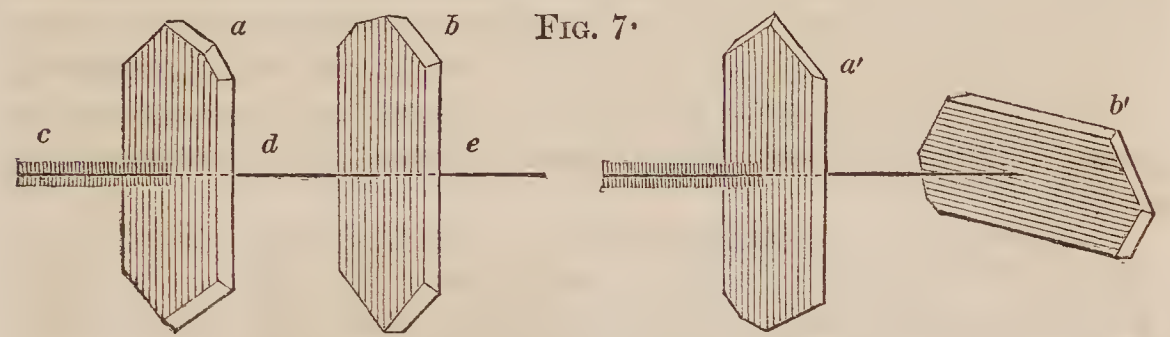
The principal constituents of the tourmaline, are *silica* and *alumina*. *Boracic acid* is always present, as also *magnesia*. *Iron*, *potash*, *soda*, *&c.*, are not constant ingredients.

For optical purposes, the tourmaline is cut in two directions, viz. *parallel*, and likewise at *right angles to the crystallographical axis*. Tourmaline plates for *polarizing or analyzing*, are cut parallel to the axis about $\frac{1}{20}$ of an inch thick; but for

depolarizing, or showing coloured rings, at *right angles to the axis.* Considerable care and experience are required to prepare good plates.* If they be not cut perfectly parallel to the axis, their polarizing and analyzing powers are greatly impaired. In buying plates, avoid cracks, flaws, and deep colours, and select those which by experiment you find to be good polarizers, for as the polarizing powers are very unequal in different crystals, nothing but a trial of each plate can determine its goodness.

The light which is transmitted by a plate of tourmaline (*a a'*) (cut parallel to the axis), is plane-polarized. A second plate of tourmaline (*b*), if held in the same position, transmits the light polarized by the first plate; but if the second plate (*b'*) be turned round, so that its axis is at right angles with the axis of the first plate, no light is transmitted.

FIG. 7.



Action of Tourmaline Plates on Light.

a. b. Two plates of tourmaline (cut parallel to the axis of the crystal), with their axes coincident; *a.* is called the polarizer, and *b.* the analyser.

c. Incident ray of unpolarized light.

d. Transmitted ray of light polarized by *a.*

e. Ray polarized by *a*, and transmitted by *b.*

a'. b'. Two plates of tourmaline with their axes opposed, so that the light, polarized by *a'*, is intercepted by *b'*.

The great objection to the tourmaline, is, that the transmitted polarized beam is more or less coloured. If large, transparent, and colourless polarizing tourmalines could be obtained, they would be invaluable to the optician.

That common light is polarized by transmission through a plate of tourmaline, as above described, is proved thus: — A second tourmaline, placed with its axis at right angles to the first, does not permit light to pass. But when the axes of the plates coincide, the light polarized by the first plate is transmitted by the second. Moreover, if the light transmitted through the first tourmaline be received at an oblique angle on a plate of glass, blackened at the back, it is reflected only on two sides of the ray, and at an angle of 56° 45′. Lastly, if it be tested by a double refracting prism, it is found to produce double refraction in two positions only of the ray, for on rotating the double refracting prism on its axis, we find that one of the images is alternately cut off, and in intermediate positions, two faint images only are produced.

[*To be continued.*]

* Mr. Darker, of Paradise Street, Lambeth, prepares tourmaline plates for most of the opticians.

PHARMACEUTICAL MEETING,

MARCH 8th, 1843.

MR. PAYNE, VICE-PRESIDENT, IN THE CHAIR.

ON THE PREPARATION OF EXTRACTS BY SPONTANEOUS EVAPORATION, ASSISTED BY A CURRENT OF DRY AIR.

BY MR. WILLIAM HOOPER,
Of 7, Pall Mall, East.

I HAVE read with much pleasure, in some of the numbers of the PHARMACEUTICAL JOURNAL, the different opinions that have been published on the preparation of the vegetable extracts, to which subject I have devoted some attention. This class of medicines has, on more than one occasion, been brought before the Society, and excited some degree of interest; but neither at the meetings, nor in any of the papers which have appeared in the Journal, have I found the information sufficiently satisfactory for practical purposes.

Although it is generally admitted, that these preparations are the most varying, imperfect, and uncertain medicines ordered in the Pharmacopœia, yet there are few, if any, which are more frequently prescribed. On comparing different samples of an extract, professedly prepared in a similar manner, so great a difference is often observable in their strength and other physical characters, that it could scarcely be credited that they were prepared from the same plant. I, therefore, think it particularly desirable to adopt a more uniform and definite method of preparation.

It is, I presume, generally known, that some Druggists have succeeded in preparing finer extracts, when deviating in some respects from the directions in the Pharmacopœia Londinensis, 1836; and it is to be regretted, that those who have found the advantage of adopting these variations, should withhold the details of their process from the profession; and here it must be understood, that I consider any one deviation from the Pharmacopœia highly censurable, unless sufficient reason can be assigned to justify the operator in so doing.

In Dr. Houlton's valuable paper on extracts, in the PHARMACEUTICAL JOURNAL, No. IX., page 490, he gives good practical reasons for preparing them at a low temperature; also in a paper, which contains much information on Taraxacum, quoted in No. VIII., page 421, he speaks favourably of the conversion of the expressed juice into an extract by spontaneous evaporation.

According to the directions for making extracts in the London Pharmacopœia, the leaves of the fresh plants are to be sprinkled with a little water; and boiling water is to be poured on the

recent roots, which are to be macerated twenty-four hours, after which a decoction is to be made, and evaporated at a boiling temperature.

I am inclined to doubt the expediency of this method for the following reasons:

First, By sprinkling water on the leaves, the amount of fluid to be evaporated is increased, as the water, as well as the juice, must be got rid of by evaporation.

Secondly, The maceration accelerates acetous fermentation.

Thirdly, The boiling temperature tends to destroy or impair the proximate principles of the plants.

I have tried many arrangements and various temperatures, and am convinced that by inspissating the expressed juice by a current of dry air, extracts may be produced of a more uniform character than those in ordinary use, and that their quality is far superior.

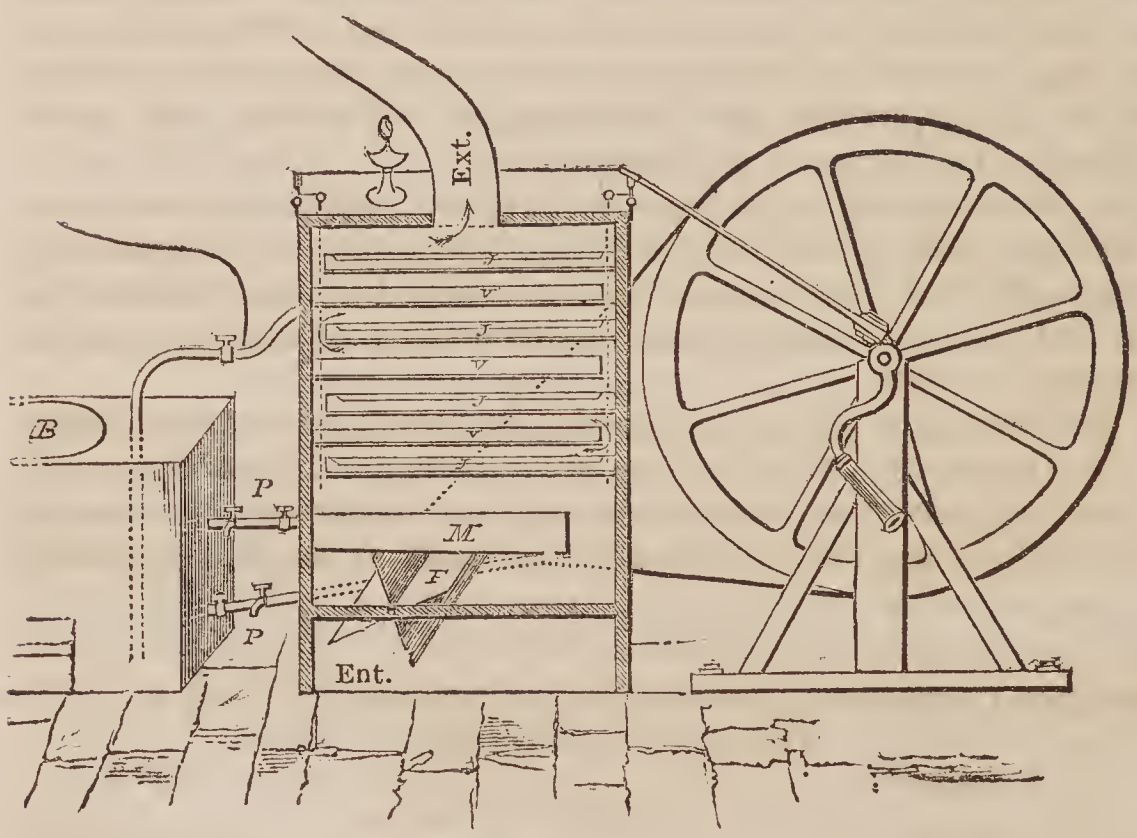
Medical men sometimes inquire what is the dose of extracts thus prepared. My answer is, the dose is the same as that for the Pharmacopœial preparation, because I believe this to be estimated with reference to the preparation in its most perfect state, and, consequently, the extracts prepared by the above process, come up to the *intentions* of the College, while those in ordinary use do not. Take, for instance, Extractum Taraxaci, made according to the Pharmacopœia, and a similar quantity made by inspissating the juice by a current of dry air, and I feel persuaded that there would be no difficulty in deciding which extract corresponds in effect with the dose ordered in the Pharmacopœia. I have the opinion of many eminent men in favour of that as well as other extracts, when prepared by spontaneous evaporation.

The process is generally considered tedious, but I have adopted an arrangement which is simple in its construction and easily managed,and which possesses these advantages: first, it augments the current of air by which evaporation is promoted; secondly, the moisture as it escapes, is absorbed by oil of vitriol placed in trays alternately with those containing the juice; thirdly, by moderately warming the current of air, and keeping the shelves in constant motion, the evaporation is further expedited. But in warm weather the application of artificial heat is not required.

In order to render the description explicit, I subjoin a drawing of the apparatus; which consists of an air-tight cupboard, furnished with shelves, so fixed as to be air-tight at each alternate end, while at the opposite end of each shelf an open space is left, through which the current of air passes. This space is equal to the distance between the shelves, namely, about three inches. The juice and the oil of vitriol are placed on the alternate shelves, the former in flat dishes, the latter in

leaden vessels. Under the lowest shelf is a flat metallic vessel, connected with a boiler by a pipe, with stopcocks for drawing off the water, if required, &c. Under this vessel is a fan revolving with great rapidity by means of a fly wheel, and propelling the air both under and over the metallic vessel, and over the series of vessels on the shelves to the top of the apparatus, where a pipe is fixed for conveying the air into a chimney. A lamp is placed under this pipe for the purpose of rarifying the air. To a crank in the spindle of the fly wheel is attached an iron rod, which communicates with the series of shelves, elevating and depressing alternately each end, so as to keep the shelves constantly in motion, by which the evaporation of the juice is promoted. By the application of this system, I find that I can evaporate six pints imperial of vegetable juice to the consistence of an extract in from nine to twelve hours.

I was induced to make trial of this arrangement for preparing extracts from a similar apparatus, answering beyond my expectation, in drying fresh leaves, recent roots, acids, alkalies, and their salts.



V Vitriol. *J* Juice.
Ent. The place where the air enters.
Ext. The place for the air to make its exit.
P P Pipes connecting the metallic vessel with the boiler.
M Metallic vessel. *B* Boiler. *F* Fan.

I am indebted to Drs. Prout, Pereira, and Hodgkin, and to Julius Jeffrys, Esq., for some useful suggestions which I have received on this subject.

The Chairman enquired whether Mr. Hooper considered his process applicable to the preparation of extracts on the large scale, by the wholesale manufacturer.

Mr. Hooper said, it was only necessary, in operating on the large scale, to employ a sufficient number of the apparatus. Five, or six, or more of them might be worked simultaneously, the motion being communicated to the fans from one source, and by this means he thought there would be no difficulty in effecting the evaporation to any required extent.

Dr. Hocken stated, that he had seen Mr. Hooper's apparatus, and had also used some of the extracts which had been made in it, and he had every reason to be satisfied with the result. He thought the method by which the evaporation was effected, was calculated to produce extracts very superior in quality to those made in the usual way, and although he had not yet compared the relative strength of Mr. Hooper's extracts with others, excepting in the case of taraxacum, yet he had fully satisfied himself, in this case, of the superiority of the extract made by spontaneous evaporation.

In answer to a question from Mr. Squire, Mr. Hooper said, the trays in which the evaporation was effected, were about four feet long, by two feet six inches wide: there were five of these trays in his apparatus, two containing oil of vitriol, and three containing the liquor to be evaporated.

Mr. Squire thought the process must be rather a tedious one, if an apparatus, presenting so large an extent of evaporating surface, effected the evaporation of no more than six pints in the day, as this would only produce on an average about six or seven ounces of extract.

The Chairman observed, that the Society was much indebted to Mr. Hooper for bringing this subject before it, and especially for making known, as he had, the practical details of his process, a kind of information which was always interesting to practical men.

ON CERTAIN PRECAUTIONS NECESSARY IN USING CHEMICAL TESTS.

BY MR. ROBERT HOWARD.

I beg to offer a few remarks upon the present state of our information as regards the tests for ascertaining the purity of chemical preparations, and the mode of applying them.

The proceedings of the Pharmaceutical Society, seconded by the abundance of valuable information which your widely-circulated Journal contains, are leading many persons to endeavour

to form their own judgment upon the purity of the articles they purchase. It becomes, therefore, of great importance that they should not be misled by trusting to directions which are not sufficiently detailed to enable them to form a correct judgment. There are several ways in which they may thus be deceived by their own experiments.

1st. In the application of a test, in itself suitable, there may be some precautions needed, the neglect of which leads to condemning a *pure* article as *impure*.

2d. The attention may be drawn to some slight and unimportant impurities, whilst gross adulterations pass unsuspected.

3d. An article may be chemically pure, and yet from its mechanical state, as regards fineness of powder for instance, ill suited to the purpose intended.

Now, the most valuable collection of information on the subject, to which we can turn for assistance, is, I suppose, unquestionably Phillips's notes in his translation of the Pharmacopœia. I find it recognized as such in the examination for membership in the PHARMACEUTICAL SOCIETY; but these notes are, from their brevity, rather suited to give hints to a person otherwise experienced, than to enable a person, without other guidance, to pronounce an opinion upon the purity of each article which may come before him. Directions, in sufficient detail to enable a person of the average degree of acquaintance with Chemistry, and with ordinary care, to avoid erroneous conclusions, are yet wanting.

In illustration of these points, I will take, first, the instance of Rochelle salt (potassio-tartrate of soda). We are informed that the solution ought not to give any precipitate with chloride of barium, or nitrate of silver. Now, I took 370 grains of the Rochelle salt, of known purity, dissolved in three ounces of water, and added 260 grains of chloride of barium, dissolved in two ounces of water: a copious precipitate fell, weighing, when dry, about 320 grains. It was of course neutral tartrate of barytes, well known as an insoluble salt. If it had been sulphate of barytes it would have indicated 442 grains of sulphate of soda.

Yet the test is a good one; the precautions needed being, first,* to dissolve the salt in twenty times its weight of water; second, to add the chloride of barium drop by drop. If the first few drops give a precipitate which is immediately re-dissolved, and the liquid becomes and remains quite bright, it may be pronounced free from sulphate of soda. If a small per centage of this salt be present, the first-formed precipitate is presently succeeded by the well-known cloud of sulphate of barytes, which

* In the last edition of Phillips's Pharmacopœia, this precaution is alluded to, the word "dilute" being used; yet an inexperienced experimenter may not find out the essential importance of sufficient dilution.

soon settles to the bottom of the vessel. If it be desirable to estimate the quantity of the impurity, more chloride of barium may be added; taking care also to add enough tartaric acid to convert any tartrate of barytes which is formed into the soluble bitartrate.

Again, to 370 grains of the same Rochelle salt, I added 425 grains of nitrate of silver, both dissolved in as small a quantity of water as could conveniently be done: a dense precipitation filled the liquid; thrown on a filter, washed with a little water, and dried, it weighed about 450 grains. It was of course tartrate of silver, differing widely in appearance from the chloride; were it taken for the latter, it would indicate the presence of 185 grains of common salt.

Yet here also the test is a good one, taking as before the precautions of dissolving in a large quantity of water, and adding the test drop by drop. If the article be free from common salt, the precipitate which is formed by the first additions of the test, is speedily re-dissolved, as long as there remains in the liquor an excess of undecomposed potassio-tartrate of soda. If on the other hand, common salt be present, the first drops of the test will presently produce the characteristic curdy precipitate of chloride of silver, which does not again dissolve.

Lime-water is often used as a test of the presence of bichloride of mercury in the chloride, but it was long since pointed out, I believe by Donovan, that the colour in this instance depends upon the rapidity with which the mixture is made. If a sufficient quantity of good lime-water be thrown upon the calomel at once, a black colour is produced, if, on the other hand, with the same materials, it be added drop by drop, a greenish colour is brought out, and the presence of bichloride suspected; the directions given by Phillips are good, as regards detecting the presence of the bichloride. The unpleasant effects occasionally produced, and attributed to the presence of bichloride, are, I believe, much more connected with the *mechanical* state of the article, to which no chemical test applies.

In illustration of the second error to which the experimenter is liable, I will take the case of the disulphate of quina. This article may be adulterated almost *ad libitum* with sulphate of cinchonine, with perfect security against detection by any test which I have ever happened to see recommended: the same thing may probably be said about its adulteration with a whole list of soluble vegetable substances, less nearly approaching in medicinal properties. Sulphate of lime may indeed be detected by its insolubility in spirit of wine, but this is, I apprehend, rather an accidental impurity than a purposed adulteration. In fact, the eye will discriminate as to the purity of this article better than the usual tests. A really good test is yet

wanted; in the mean time allow me to suggest, as an approximation, one founded on the wide range of solubility at different temperatures, which this substance is well known to possess, and in which it differs from everything, as far as I am aware, with which it is likely to be adulterated.

Put one hundred grains in a Florence flask, with five ounces of distilled water, and heat it over a spirit lamp; when it boils, notice whether complete solution is effected by this quantity of water; if so, your specimen is too soluble, and probably contains either some soluble adulteration, or some impurity, which renders the disulphate itself more soluble. Add two ounces more water (taking care to manage the flame of the lamp so as to avoid loss by evaporation): this quantity *boiling briskly* ought to dissolve the one hundred grains—if more is needed sulphate of lime may be suspected (and recognized by the test of spirit of wine). Now let it crystallize in the flask, and when quite cold, filter out the crystals, washing out the flask with some of the filtered liquor, to avoid using any more water. Put the filter with the crystals on it upon blotting-paper folded many times, to absorb the mother liquor; let them dry in the air till they are quite dry to the touch, but not effloresced. In this state they ought to weigh about ninety grains, the mother liquor and unavoidable waste even of so simple a process, accounting for the rest. If the mother liquor be evaporated to one ounce, a second crop of about six grains may be obtained. The remaining mother liquor ought not, when evaporated to dryness, to yield more than two grains; any soluble impurity will of course increase the quantity of residuum. It will be well to try some which you have recrystallized, as a standard experiment, as the results depend in some degree upon the skill of the operator.

Iodide of potassium is another instance of the inefficiency of the tests frequently applied. A curious instance of this is given in a former number of your Journal *, which mentions that some purchasers of this article thought it better when it gave out iodine on the addition of tartaric acid, while this was, in fact, an indication of its containing idodate of potash; but on the other hand, if not *better*, neither would it be considered, for practical purposes, *worse*, for the presence of, perhaps, one per cent. of iodate of potash (much more than this would, I think, be evident to the eye); and the whole quantity which it would contain, if prepared in the most slovenly way, would perhaps scarcely affect its medicinal properties to an appreciable extent. Another test is lime water; this will detect the presence of a minute quantity of carbonate of potash, perhaps one per cent., or less, equally unimportant in practice, as, if well crystallized, the quantity present

* Vol. i., page 418.

cannot be large. The chief point to be guarded against as regards carbonic acid, is the article made by dissolving iodine in carbonate of potash, a compound which ought not to be substituted for iodide of potassium; but which, in fact, differs so widely from it in its appearance, being nearly amorphous instead of crystalline, that there is little danger of its being substituted.

But whilst comparatively trifling points are thus guarded, the door is left wide open for any intentional adulterator, who is disposed to mix chloride of potassium with the iodide. It will pass the ordeal of the tartaric acid, and of the lime-water, with perfect security, its crystalline form will not betray it, its solubility in water does not differ sufficiently to excite suspicion, unless very carefully tried, and it has the recommendation of being *very cheap*. The only test yet given, which comes up to the requisite point of security, is that given by Phillips, the quantity of nitrate of silver required for complete decomposition. The very great difference in the atomic weights of chlorine and iodine makes this an excellent test, and it is capable of being employed to ascertain the extent of adulteration. Another plan, founded on the same principle, is to take ten grains of the suspected iodide, with ten or fifteen grains of oil of vitriol, and to heat them to a low red heat in a platina crucible, as long as vapour is given off: bisulphate of potash is left; if the iodide of potassium be pure, about eight grains, if chloride of potassium be treated in the same way, about seventeen grains remain; of course an adulterated article gives an intermediate weight. This process, however, though well adapted for a first experiment, requires some nicety in the degree of heat, and therefore should not be depended upon alone.

Nitrate of silver is, perhaps, more frequently adulterated with nitrate of potash than with any other substance: and this also escapes the usual tests. It may be detected in the following way:—Dissolve one hundred grains of the suspected nitrate of silver, and add *pure* muriatic acid as long as any precipitate is formed; a moderate quantity in excess is of no consequence; collect the chloride of silver, which, when dried, ought to weigh eighty-four grains. Evaporate the mother liquor — if the sample was *pure*, nothing would be left in it but the nitric acid, and any excess of muriatic acid which had been added, both of which are driven off along with the water, leaving no residuum; any impurity, such as nitrate of potash, remains, and may be weighed, and will probably be found to correspond with the amount of impurity, as ascertained by the deficiency in the weight of the chloride.

The above are a few of the most striking instances which

occur to me at present. Perhaps, some of your able correspondents, who can find leisure for it, will pursue the subject, as regards the tests for other preparations.

Stratford, Feb. 10, 1843.

Mr. Fownes thought it was always understood, that in using tests, dilute solutions should be employed. There could be no doubt, that if this, which was a rule invariably adopted by the scientific Chemist, were deviated from, very erroneous conclusions might often be drawn from the use of tests, as was clearly shown in the interesting paper just read. The means of determining the purity of the substances employed in medicine, was an interesting subject for the study of those engaged in Pharmacy, and the papers on this subject which had appeared in the PHARMACEUTICAL JOURNAL, were likely to do much good. In a late number of that publication, there was a notice of the adulterations of iodide of potassium, in which a good method was described for detecting the presence of chlorides of sodium or potassium in this salt. With reference to the nitrate of silver, he thought it possible that this substance might be sometimes adulterated with nitrate of lead, if so, this adulteration might be detected by adding hydrochloric acid to a solution of the nitrate, and then digesting the precipitate in solution of ammonia, when the chloride of lead would be left as an insoluble powder.

Mr. Squire queried whether the Pharmaceutical Chemists of the present day were so proficient in the knowledge of chemical analysis as Mr. Fownes appeared to imagine, as he had frequently seen those errors committed, which it was the object of Mr. Howard to guard against. The importance of attending to the state of dilution in these manipulations, was generally known by practical analysts, but he thought the subject was treated by Mr. Howard in a manner calculated to be particularly instructive and interesting to the members of the PHARMACEUTICAL SOCIETY.

In reference to Dr. Gardner's paper, which was read last month, Mr. Robert Howard submitted to the Society five specimens of

CALOMEL.

Specimen 1. Calomel sublimed in glass.—This specimen is crystallized in masses; being parts of the cake formed on the inner surface of the glass receiver. It is perfectly colourless, except at the points of concussion where the cake has been broken.

Specimen 2. Calomel condensed by air.—This is crystalline, and nearly colourless.

Specimen 3. Calomel condensed by air.—This specimen is in the form of powder, but too coarse for medicinal use. It is perfectly white.

Specimen 4. Hydro-sublimed calomel, prepared by Howards and Kent's steam process.—This is in extremely fine powder, and perfectly white.

Specimen 5. Calomel, as usually sold by Messrs. Howards and Kent, and having a slightly yellowish tinge.

Mr. Howard, in a letter which accompanied the specimens, observes, that

"Dr. Gardner's paper illustrates the difference which the mechanical state of a substance may produce in its medicinal effects. It is, however, quite a mistake to suppose that calomel is *necessarily* or *generally* in finer powder when white; it may be, and sometimes is, very coarse, and yet white, as the specimens which I send will serve to show.

"It is a curious fact, that the hydro-calomel, which is in a far more impalpable powder than any other, is objected to by some as not sufficiently active, except in increased doses, four grains being about equal to three, although it has been found to answer extremely well in many cases, more particularly in the diseases of children."

ON SYRUP OF POPPIES.

BY MR. THOMAS SOUTHALL.

Having found great difficulty in obtaining an elegant preparation of syrup of poppies, by the process directed in the London Pharmacopœia, we have tried various means of improving it, and think we have succeeded in doing so by extracting the virtues of the poppy by percolation with cold water, and, as far as we can judge, without impairing in any degree the efficacy of the syrup.

The capsules, from which the seeds have been separated, are weighed, and then dried, by which they lose from ten to fifteen per cent. They are then bruised, and passed through a sieve of $\frac{3}{8}$ths-inch mesh. They are next macerated in a mash-tub, several portions of cold water being added, and stirred with them, to ensure the whole being uniformly moistened. About an hour afterwards, the infusion is drawn off from the bottom of the vessel, more water being poured on the surface; after which the

infusion is allowed to run off during the day. The quantity of water used is about the same as that which is directed in the Pharmacopœia. The infusion is evaporated as it is drawn off, to nearly the consistence requisite for making the syrup, and allowed to stand during the night. The clear portion is poured off the following morning, the remainder strained through a calico bag, and the sugar is dissolved in the clear liquor with as much heat as is requisite for the purpose. The medicinal properties of the poppies appear to be extracted effectually by means of cold water, while the syrup is brighter and of better quality, on account of the absence of the starch, which is dissolved in it, if boiling water is used in making the infusion.

The poppy capsule appears to contain both albumen and starch, and when the former is solidified, and the latter converted into a jelly by the application of boiling water, the medicinal principles of the poppies are extracted with more difficulty. Syrup of poppies, as usually prepared, is very liable to fermentation; this I attribute chiefly to the presence of the starch, which is favourable to this kind of decomposition, and which, by increasing the density of the fluid to a consistence approaching to that of a jelly, obstructs the separation of the fæces by decantation or filtration.

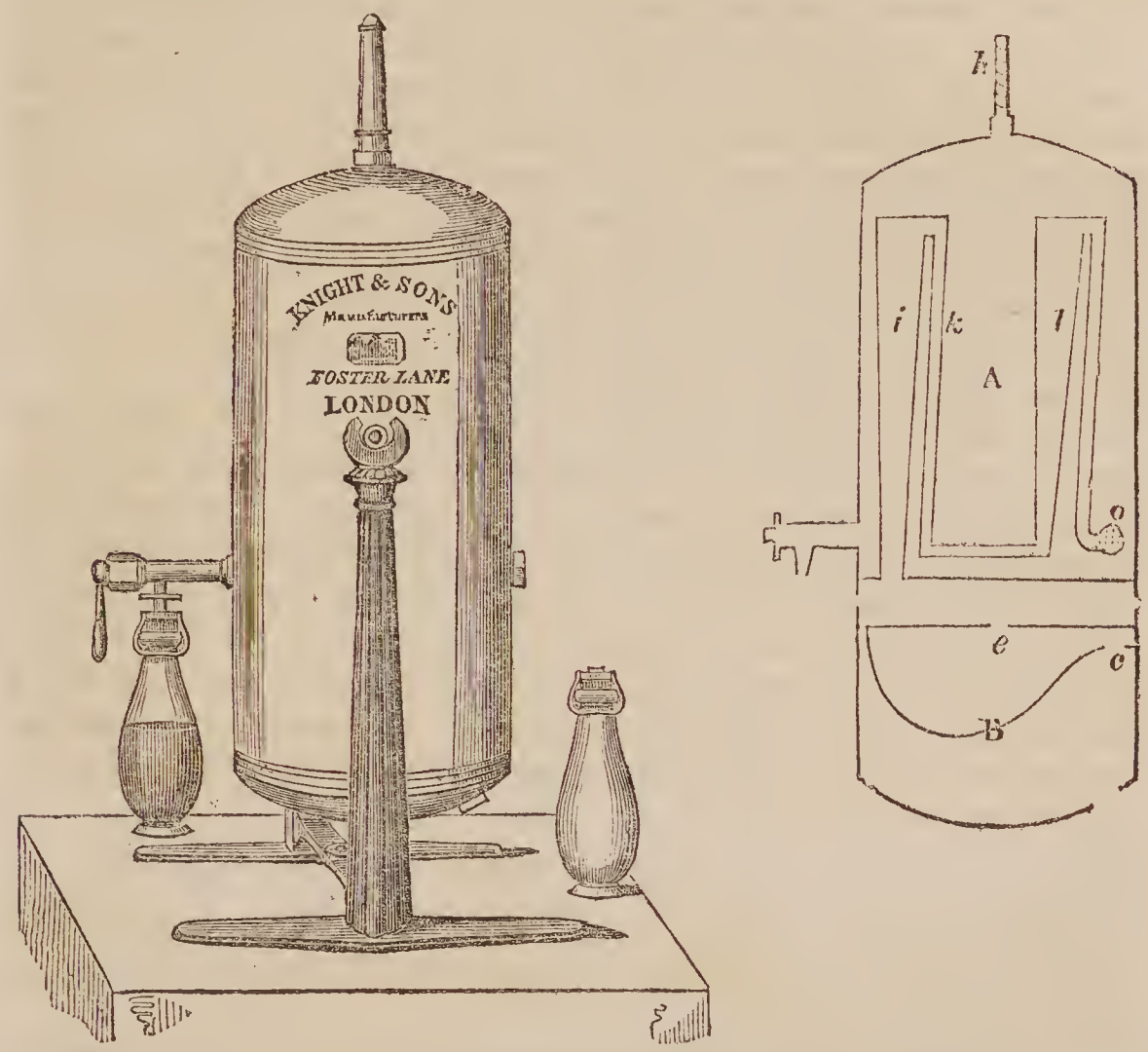
The Chairman enquired, whether any Member present had tried the effect of cold water in preparing the infusion of poppy capsules for the syrup.

Mr. Redwood submitted to the meeting a sample of syrup of poppies, prepared by Mr. Deane, of Clapham, several months ago, which appeared to be in excellent condition, and possessing the flavour of the poppy in great perfection. It had been prepared by cold infusion, evaporated *in vacuo*, at a low temperature, the sugar being added at the end of the process, with such an elevation of temperature as was just sufficient to effect its solution.

Mr. Heathfield stated, that he was in the habit of employing tepid water in the preparation of infusions generally, especially in the case of substances containing starch. He had adopted the same plan with success in making syrup of poppies.

Mr. Pedler adverted to the circumstance that poppies, as well as many other vegetables, contained albumen as well as starch; the latter being insoluble in cold water, while the former was coagulated by the application of a boiling temperature. He therefore suggested, in reference to Mr. Deane's process, that although it might be desirable to prepare the infusion with cold water, in order to prevent the solution of the starch, the liquor, when strained, should be boiled, so as to get rid of the albumen.

Mr. Knight, of Foster Lane, exhibited an apparatus for the extemporaneous manufacture of soda-water, a representation of which is subjoined.



A B are two distinct earthenware vessels joined together, and cemented inside a strong iron cylinder; in the lower one, *B*, the gas is generated, and the upper one, *A*, contains the water or other liquor to be aërated.

The vessel *B* is separated by a partition into two parts; the lower one contains the carbonate of soda, and the upper dilute sulphuric acid. Through a little aperture, *c*, a small quantity of the latter flows out at every vibration of the cylinder on to the carbonate of soda, thereby generating carbonic acid gas, which passes through the hole *e*, in the top of the lower vessel, rushes up the large conical tube *i*, when it is forced down the smaller one *k*, into the second large one *l*, which acts as a second gas-purifier; it is then forced down the other small tube, and issues from a number of minute holes at *o*, rising through the water contained in the vessel *A*. The vibration of the machine agitates the water, and occasions the gas to be absorbed almost as quickly as it is produced. A quarter of an hour is generally sufficient to complete the process. The pressure-gauge, *h*, indicates the number of atmospheres of gas the water contains. It will be observed, that there is no communication whatever be-

tween the lower vessel, where the gas is generated, and the upper one containing the water, except through the gas-pipe *i*.

The Chairman, before closing the meeting, thought it right to remind the members, that this was the first meeting since the Society had obtained a Charter of Incorporation, by virtue of which, it had become acknowledged by the law of the land, and thereby its political position was materially altered. The preamble of the Charter stated, that Her Majesty, with the consent of her advisers, had been induced to grant this boon, believing that the association would be the means of advancing the arts of Chemistry and Pharmacy, and of thus contributing to the welfare of the public. Now, whatever might have been the motives which had induced Members to join this association, it must be remembered—that they were pledged to do all in their power to elevate the profession to which they belonged, and to show themselves, in this way, deserving of the favour conferred upon them. He hoped it would not be thought by any of them, that having arrived at this satisfactory point, their work was done. He for one did not think so, and he trusted that no man did; but on the contrary, he felt called upon to employ every means in his power to carry out the great end the Society had in view. The Pharmaceutical meetings would doubtless be the means of advancing the great object of the Institution, and this ought to be a stimulus to a frequent and regular attendance. The Council were most anxious, always, to cater for the entertainment and improvement of the members, but they must look to the members themselves for the means of so doing. He was very happy to say that competent judges had spoken favourably of the papers that had been read at the meetings from time to time. He hoped that the Members of this Society would always be disposed to speak and to act towards other corporate bodies with due deference and respect, and he also hoped, since the government of the country, in their wisdom, had thought proper to recognize this Society as an integral part of the medical profession, that other corporate bodies—more especially the College of Physicians—would manifest the same disposition towards the Society. This meeting would bear witness that he was a strong advocate for strict observance of all the formulæ contained in the Pharmacopœia; but it was no more than right to expect that those formulæ should be of a scientific character and founded on the best practical experience, and whilst he and the members of this Society would be quite willing and anxious to pay deference and respect to those who, by their education and station, were supposed to be best able to superintend the arrangement of the remedies, in his opinion, practical matters were best understood by practical men, such as he hoped would ever be found among the members of the PHARMACEUTICAL SOCIETY.

OTHER ORIGINAL COMMUNICATIONS.

ILLUSTRATIONS OF THE PRESENT STATE OF PHARMACY IN ENGLAND.

BY RICHARD PHILLIPS, F.R.S., &c.,
Honorary Member of the Pharmaceutical Society.

The preparation which I shall next notice, as having submitted to examination, is the Spiritus Ammoniæ Aromaticus; it is not, indeed, a medicine of the greatest importance, but as a domestic remedy it ought to contain the proper quantity of carbonate of ammonia, and being employed in preparing the tinctura guaiaci composita, it should have the requisite quantity of spirit.

The specific gravity of this medicine, when prepared according to the Pharmacopœia, I find to be 0.911; having obtained some from five different Chemists, three of whom reside many miles from London, I ascertained the specific gravity of the samples to be as under:

No. 1.....	0.910
No. 2.....	0.882
No. 3.....	0.888
No. 4.....	0.913
No. 5.....	0.916

Contrary to what I expected, some of these specimens were of less density than the college preparation; and it will be seen from the annexed statement of proportional strengths, that the density cannot be satisfactorily assumed as a standard of comparison.

To determine the comparative quantities of carbonate of ammonia which the above specimens contained, I added to equal portions of them a given weight of fragments of marble, and equal volumes of dilute hydrochloric acid, of ascertained solvent power: the larger the quantity of marble dissolved, the less would be the quantity of carbonate of ammonia; and I found the comparative strengths, with regard to carbonate of ammonia, to be as follows:

College preparation (assumed as)	= 100
No. 1.	= 120
No. 2.	= 100
No. 3.	= 120
No. 4.	= 38
No. 5.	= 101

I may here observe, that I ascertained some time since that the carbonate in the Spiritus Ammoniæ Aromaticus is a neutral salt, consisting of one equivalent each of acid and alkali; and it is on this account more pungent than the sesquicarbonate of ammonia. Upon the whole, with the exception of No. 4, the specimens of this preparation which I have examined, are less imperfect than any others previously submitted to examination, the variation in strength, with the exception above made, not being in greater proportion than six to five.

I next tried the Tinctura Ferri Sesquichloridi obtained from three different persons, and in this case, the variations, both from what the medicine ought to be, and from each other, are much less considerable than the previous examinations of other preparations would have induced me to suspect. I shall, however, probably examine a few more specimens of it.

When prepared according to the College, the specific gravity of this tincture is about 0.992, and a fluid ounce, when decomposed by ammonia, yields nearly thirty grains of sesquioxide of iron. Of the three samples which I examined, I found the specific gravity, and the quantity of sesquioxide of iron in a fluid ounce to be:

	Specific gravity.	Sesquioxide of Iron.
No. 1	0.990	27.2 grains
No. 2	0.993	27.2 „
No. 3	0.986	25.4 „

All the specimens contained sulphuric acid, owing probably to the employment of impure hydrochloric acid, this, as I have shown on a former occasion, being a very common admixture.

Ferri Ammonio-chloridum.—Of this medicine I have also examined three specimens, and if some of the parties who prepared them had acted on the principle that a medicine which is rarely used may, therefore, be badly prepared, they appear to have acted with a great degree of consistency in suiting the preparation to the principle.

As formerly obtained by sublimation, this medicine was, I believe, from the very nature of the process, extremely uncertain in its strength. In the present Pharmacopœia, however, all pretext for uncertainty is got rid of by the process introduced, which consists in boiling down to dryness a mixed solution of hydrochlorate of ammonia and sesquichloride of iron. I find that the College preparation, when decomposed by ammonia, yields about 7 per cent. of sesquioxide of iron; the three specimens which I purchased, yielded,

No. 1	3.9 per cent. of Sesquioxide of Iron.
No. 2	7.6 ditto
No. 3	1.4 ditto

ON THE METHOD OF DETERMINING THE SPECIFIC GRAVITIES OF FLUIDS.

BY GEO. FOWNES, PH. D.

By the term *specific gravity*, applied to any substance, is meant the relation which its weight bears to the weight of *an equal bulk* of some other substance taken as the standard of unity. Now in all cases of solids and liquids this standard of unity is pure water at the temperature of 60° Fahr.; anything else might have been chosen; there is nothing in water to render its adoption for

the purpose mentioned indispensable; it is simply taken for the sake of convenience, being always at hand, and easily obtained in a state of perfect purity. The ordinary expression of density or specific weight, therefore, is a number expressing how many times the weight of an equal bulk of water is contained in the weight of the substance spoken of. If, for example, we say that concentrated oil of vitriol has a specific gravity or weight equal to 1.85, or that perfectly pure alcohol has a density of .794 at 60°, we mean to say that equal bulks of these two liquids and of distilled water possess weights in the proportion of the numbers 1.85, .794, and 1, or 1850, 794, and 1000. It is necessary to be particular about the temperature, for the obvious reason that, since liquids are very expansible by heat, a constant bulk of the same liquid will not otherwise have a constant weight.

In order, therefore, to obtain at pleasure the specific gravity of any particular liquid compared with that of water, it is only requisite to weigh equal bulks at the standard temperature, and then divide the weight of the liquid by the weight of the water; the quotient will be of course greater or less then unity, as the liquid experimented on is heavier or lighter than water. Now, to weigh equal bulks of two fluids, the simplest and best method is clearly to weigh them in succession in the same vessel, taking care that it is equally full on both occasions: a condition very easy to comply with. The following is the plan adopted in the scientific laboratory where great accuracy is required; the Pharmaceutical Chemist will do well to follow the same process as nearly as his means permit, or the circumstances of the case demand:—

A thin glass bottle or flask with a narrow neck is procured, of the figure represented in the margin, and of such capacity as to contain, when filled to about half-way up the neck, exactly 1000 grains of distilled water at 60°; such a flask is easily procured from any one of the Italian artificers, to be found in every large town, who manufacture cheap thermometers for sale. A counterpoise of the exact weight of the empty bottle is next prepared from a bit of brass, or an old weight, or something of the kind, and carefully adjusted by filing—an easy task. The bottle is then graduated, by introducing water at 60°, until it exactly balances the one-thousand grain-weight and counterpoise in the opposite scale; the height at which the water stands in the neck is marked by a scratch, and the instrument is complete. When required for use, the liquid to be examined is brought to the

temperature of 60°, and with it the bottle is filled up to the mark before mentioned: it is then weighed, the counterpoise being used as before, and the specific gravity directly ascertained.

A watery liquid in a somewhat narrow glass tube always presents a curved surface, from the molecular action of the glass, the concavity being upwards; it is better, on this account, in graduating the bottle, to make *two* scratches, as represented in the sketch, one at the top and the other at the bottom of the curve, this prevents any future mistake; the marks are easily made by a fine, sharp, three-square file, the point of which also, it may be observed, answers perfectly well for writing upon glass, in the absence of a proper diamond pencil.

The specific-gravity-bottle above described differs from those commonly made for sale by the instrument-makers; these latter are constructed with a perforated stopper, so arranged, that when the bottle is quite filled, the stopper put in its place, and the excess of liquid wiped from the outside, a constant measure is always had. There are inconveniences attending the use of the stopper, which lead to a preference of the open bottle, with merely a mark in the neck.

It will be quite obvious that the adoption of a flask holding exactly one thousand grains, has no other object than to save the trouble of a very trifling calculation; any other quantity would answer just as well, and in fact, the experimental Chemist is often compelled to use one of much smaller dimensions, from scarcity of the liquid to be examined. The shape is also of little consequence, any light phial with a narrow neck may be employed, not quite so conveniently, perhaps, as a specific-gravity bottle.

The above method is much to be preferred, in most cases, to the use of any of the various floating instruments, such as hydrometers, beads, &c.; these are often exceedingly inaccurate, and require careful verification before they can be depended upon. This verification demands a good deal of tact and experience on the part of the operator. It is performed by placing the hydrometer successively in a series of liquids, whose specific gravities have been carefully determined by an independent process, and observing whether the right density be indicated by the instrument. For a great number of purposes in the arts and in pharmacy, where an approximation only is wanted, the hydrometer is a very useful instrument. It is better to have it constructed of glass than of metal: a bruise on the float of a metallic hydrometer destroys its accuracy, and may escape notice; while if glass had been the material, it would have been broken and replaced by a perfect one. The glass hydrometers are, besides, far easier to make and less costly than those of metal.

January 20, 1843.

ON THE PREPARATION OF HYDROSULPHURET OF AMMONIA.

BY MR. WOOLEY.

I THINK it probable that the following formula for preparing hydrosulphuret of ammonia, may be interesting to the readers of the PHARMACEUTICAL JOURNAL, as I am not aware that it has ever been employed out of my own laboratory. Its advantages over the usual process of saturating a solution of ammonia with sulphureted hydrogen, will, I am sure, be acknowledged by all who will take the trouble of trying both forms.

Prepare pure caustic lime by calcining white marble: after slaking, boil it with sublimed sulphur, in the proportions of one part of sulphur to two of the anhydrous lime first prepared. Filter, and to the filtered solution add sixty-six parts of sulphate of ammonia, to every sixteen parts of sulphur used. Sulphate of lime is shortly thrown down, hydrosulphuret of ammonia remaining in solution, sufficiently pure for most experimental uses. It may, of course, be easily rendered quite pure by distillation, putting any convenient quantity of distilled water into the receiver, and taking care to use green glass vessels in the operation.

Manchester, Feb. 11, 1843.

ON THE INJURIOUS EFFECTS OF THE VAPOUR OF CANTHARIDES.

BY MR. THOMAS SOUTHALL.

ABOUT ten years ago, I was attacked with violent inflammation of the eyes, while preparing the unguentum cantharidis. A few pints of the infusion were strained off, and poured into a copper pan heated by steam: a strong smell of cantharides was immediately perceptible; and in the course of five or six hours, inflammation in the eyes came on, which confined me to the house for two or three days.

In the spring of 1841, I met with a similar accident, but the effects were much more severe, and the suffering much greater. Being desirous of improving the consistence of some emplastrum cantharidis, which was rather too soft, I mixed a small portion of wax with it. The wax had been melted over the fire, and was poured into a deep steam-pan, the capacity of which was about thirty gallons. The plaster, partially melted, was added in small portions at a time, and in stirring the whole together, it was necessary to lean over the pan, in order to reach the bottom, on which a strong odour of cantharides was observable, as on the

former occasion. The effect of the poison, absorbed by the eye, was not manifested until some hours afterwards, but the inflammation was so severe that I was blind for several days. By the application of leeches and, after the inflammation had partially subsided, a lotion of sulphate of zinc, the symptoms were entirely removed, and I am not sensible of having sustained any permanent injury. The circumstance, however, may serve as a warning to others, when engaged in similar operations, as it appears that much mischief may be done by exposing the face to the vapour of cantharides, although no inconvenience is felt at the time, except the strong odour of the cantharides, which, in this instance, may be considered a criterion of its deleterious action.

DETERMINATION OF ATOMIC FORMULÆ.

In order to get the *rational* formula of any chemical compound, that is, the expression of its real constitution, according to the views generally received on such matters, it is necessary to know not only its composition in the hundred parts, but its combining number also, as determined by a set of separate and independent experiments. When information on the latter point is not to be had, we are obliged to content ourselves with an *empirical* formula, representing the simplest possible relations of the elements concerned. This is arrived at by the very obvious method of dividing the quantity of each element contained in one hundred parts by its individual equivalent number; the quotients, of course, exhibit the relations of those equivalents in the substance. To take a case suggested by a Correspondent:—he finds in 100 parts of a certain organic body,

Carbon	42.4
Hydrogen	6.5
Oxygen	51.1
	100.

$$\frac{42.4}{6.1} = 6.95 \qquad \frac{6.5}{1} = 6.5 \qquad \frac{51.1}{8} = 6.387$$

The equivalents are, therefore, in the proportion of

6950 equiv. carbon.
6500 " hydrogen.
6387 " oxygen.

Now, in the practical analysis of organic substances, the hydrogen, for certain reasons, usually comes out a little too high, so that any one accustomed to these researches, on looking at the above numbers, will at once arrive at the conclusion, that in the substance in question the oxygen and hydrogen exist in the pro-

portions to form water, that is, there are as many equivalents of the one as of the other.

With respect to the carbon, again, the numbers 695 and 650 are so nearly in the proportion of 12 to 11, that, taking into account the little excess of hydrogen just mentioned, we have every reason to receive these numbers as the correct ones. In this manner the formula

$$C_{12}\,H_{11}\,O_{11}$$

is deduced.

This is the formula of cane-sugar, reckoned to one hundred parts, by a process exactly the reverse of that described; it gives,

Carbon	42.58
Hydrogen	6.37
Oxygen	51.05
	100.

These numbers are sufficiently near the analytical results to show the value of the latter; moreover, the errors *are in the right direction.*

It must be obvious, that if ever circumstances permit the determination of the combining number, and the consequent deduction of a rational formula, this latter will either coincide with the empirical formula, or its quantities will be multiples of those of the latter.

EXTRACTED ARTICLES.

ON THE PREPARATION OF ENGLISH CALOMEL.

BY M. CALVERT.

The importance of being able to manufacture, in France, a calomel as good and as cheap as that which is imported from England, renders it a matter of interest to know the exact process adopted by the London manufacturers. It must be observed, however, that the following details are merely given as a supplement to the very ingenious paper on the preparation of calomel, by M. Soubeiran. This Chemist has in fact discovered the basis of the English process, his method of operating differing only in the nature of the apparatus employed. The material principle is the same in both cases, namely, the employment of a chamber, into which the vapour of the calomel is conducted, sufficiently large for the air contained in it to hold the particles of calomel in suspension during the condensation of the vapour, and thus to prevent its crystallization.

The apparatus employed in England consists of an iron cylinder about thirty-inches long and twelve-inches diameter, closed at one end by a kind of door in the same way as the cylinders employed in the manufacture of hydrochloric acid. It is at this end that the materials used in making the calomel are introduced. The other end of the cylinder has a neck or contraction, six inches long and six inches in diameter. This neck is made large, so that it may not get stopped up by the condensation of the calomel. The neck of the cylinder penetrates the side of a bricked chamber, lined on the inside

with flag-stones. This chamber is about six feet six inches high, and four feet six inches wide; the bottom is a little sloped, and in one of the sides is a door for removing the product of each operation. Lastly, the cylinder is set in a furnace in such a manner that the flame entirely envelopes it.

The calomel is introduced into the cylinder, and a small quantity of corrosive sublimate is added, to supply chlorine to a portion of mercury, which appears to result from the partial reduction of the protochloride. But it is found that this decomposition may be almost entirely prevented if, instead of using calomel, the substances from which it is produced be employed, mixed in the proper proportions. The calomel thus obtained is so pure, that it merely requires to be once washed.

I could not believe for some time that an iron cylinder could be used, for it appeared to me that this metal would cause a decomposition of the protochloride of mercury, the iron being converted into perchloride with the chlorine of a part of the calomel, and this would be volatilized with the remaining calomel and the mercury, thus injuring the beauty and purity of the product; but on further reflection it appears that this change could hardly take place at a temperature so high as that which is necessary for working an apparatus containing many pounds of the materials for producing calomel.—*Journal de Pharmacie.*

ON RHUBARB.

BY FR. CALAU,
Apothecary at Kiâchta, in the Rhubarb Factory.

The general use of Bucharian * rhubarb in Europe and other parts of the globe, has directed the attention of the learned to this therapeutic agent; and many have given themselves much trouble to gain more certain information of the source whence it is derived, of its introduction, by barter, into Kiâchta, and its use in the territories under Chinese dominion. All that we yet know of the rhubarb plant or its origin is defective and wrong; every sacrifice to obtain a true plant, or the seed, has been in vain; nor has the author been enabled to procure it. A severe prohibition from the Chinese government, who fear that the rhubarb plant may be introduced into our territories, and the trade in consequence cease, prevents all possibility of eliciting the truth. The author, however, from his appointment, has had opportunities of making enquiries of the Bucharians, who are employed in transporting the rhubarb, into the source and preparation of the root, and into the cause of its decay at the place where it is collected, by observation on the dried rhubarb; and thus to effect some improvements in the examination and selection of this remedy.

The rhubarb brought into Siberia grows wild in Chinese Tartary, especially in the province Gansun, on hills, heaths, and meadows, and is generally gathered in summer, from plants of six years of age.† When the root

* The name "Bucharian" rhubarb might lead to the error of supposing that the root is found in Bucharia, whereas its name is derived from the circumstance of a few Bucharian families having been the dealers and purveyors to the Russian crown for a century. The name Chinese-Russian rhubarb would be better. In commerce, a variety of rhubarb is known by the name of Bucharian rhubarb, which has not been subjected to examination, and therefore contains many bad pieces.

† The hills of Tartary are barren and dry: the rhubarb growing there does not flourish, and the roots gathered on the hills differ from those gathered in the plains, they have the same structure but are much smaller; and with dark irregular veins and cavities dependent on the defective nutrition of the plant. The Bucharians prefer it to that grown in the plains for its activity. The author could not discover any difference in their activity.

is dug up, it is washed to free it from earthy particles ; peeled, bored through the centre, strung on a thread, and dried in the sun. In autumn, all the dried rhubarb, collected in the province, is brought in horse-hair sacks, containing about 200lb., to Sinin (the residence of the dealers), loaded on camels, and sent over Mongolia to Kiâchta, Canton, Macao, and partly to Pekin. All the rhubarb brought to Kiâchta undergoes an examination, prescribed by the Imperial Russian Medical Council, according to directions of the Russian government. The selection takes place, for the rhubarb bartered for by Russian merchants, in the custom-house at Kiâchta, and for that selected for the crown, in a house for that purpose on the Chinese borders.

In this selection the following rules are chiefly to be observed :

a. To select pieces obtained from dead plants, which are porous, of a grey colour, and, besides fibrine and oxalate of lime, contain little of the other constituents of rhubarb.

b. To select pieces that are small, derived from young plants, and which are of a pale colour, and without much virtue.

c. To select roots of other plants, which are casually or purposely mixed with the rhubarb.

d. To pare the rhubarb. This is done, first, to remove remaining portions of the bark and the upper part of the root * ; and, secondly, to clean those parts that may be stained with the sweat of the camels.

e. To perforate all pieces, and examine their interior. This examination is most necessary, as many pieces, from the rapid drying in the sun, are perfectly sound externally, and have the smell and taste of a perfect root, but are decayed in the interior. This internal decay † is chiefly found in round or cylindrical, rarely in flat or semi-circular pieces. The rot shows itself at first as little black points, of the size of a pin's head, which increase according to the quantity of moisture in the pieces, and at last form an heterogenous dark brown or green mass. In cylindrical and round pieces this mass assumes the form of an egg ; in the flat pieces, on the other hand, the rot forms parallel strata, of which we find one, two, or more, according to the size of the piece. As in the round, cylindrical, and oval pieces the rot is not always in the centre, it is prescribed, for greater accuracy, not only to perforate such pieces, but to break them through.

f. To dry those roots again which may be moist. As the rhubarb taken in exchange by the crown is not permitted to be imported into the European part of Russia, except in quantities of 1000 puds or 40,000 pounds, the roots approved of, after the examination, are packed in bags and placed where there is a free current of air, until the necessary quantity has accumulated, which is then packed in cases capable of containing 4-5 puds. The chests are covered with linen and pitched, then sewed into skins, and marked with the year of the importation of the root and sent to Moscow. The reason for this care in preventing the access of air where it is warehoused, is the affinity of the root for water, which much impedes the selection and packing of it. Dry rhubarb is proved to have hygrometrical properties, to become moist a few days before rain, and to become dry with the return of fair weather ; it is also certain that rhubarb only can be preserved with a free access of air, for if it is hermetically packed it loses its colour and peculiar odour. The packing, therefore, in pitched chests, is only a precaution on the part of the Russian government to prevent the root from becoming wet by rain, or the

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* The internal decay is not only dependent on the rapid exsiccation of the root, but they were most probably decayed when gathered.

† Rhubarb was formerly imported with the bark, but the weight was found by the Bucharians an objectionable inconvenience in the carriage of it, and they now take the bark off when they gather it, but so imperfectly, that a second operation is necessary.—*Pharmaceutisches Central Blatt.*

overflowing of the rivers, in the transport from Kiâchta to Moscow in winter. The barter of rhubarb is carried on by the Russian government, under a contract made with Bucharians at Kiâchta for ten years, and confirmed by the Chinese government. According to this contract, the Bucharians undertake to furnish a certain quantity of rhubarb annually to the Russian crown, for a certain quantity of goods of a certain quality, and to deliver up all rhubarb not approved of, without remuneration, and permit it to be burnt by the Russian government.

Bucharian rhubarb is used by the Mongols, Mandschurians, and Bucharians, as an universal remedy. The internal use with them is the same as with us, only that they administer it in very small doses, and always combined with mineral substances. Externally it is used against caries of teeth, as an antiseptic and astringent in wounds and ulcers, for man and cattle. In China, another sort of rhubarb is preferred to the Bucharian, it grows wild, and is cultivated in the province Si-tschu-an, whose name it bears: it is met with only in pieces of 2-3 inches in length, and one to one and a half in thickness. The Chinese ascribe to the Bucharian variety drastic qualities, which lead them to prefer the Si-tschu-an variety, the Bucharian they only administer in rare cases, and in very small doses.—*Gauger's Repert.* 1842, p. 452–457.

ON COCA AND MATICO.

BY DR. MARTIUS.

Dr. Martius examined a specimen of the noted Coca or Ŷpada of the Brazils. It is the leaf of the Erythroxylon Coca growing on the other side of the Andes. These leaves are chewed by the native Indians, as we use tobacco, a small pinch is wetted with saliva, and made into a ball with unslaked lime. The Indians who are capable of undergoing great fatigue, will, during the most strenuous exertion, subsist on one or two spoonfuls of maize flour mixed with water, daily, and their coca. The use of this plant has become as much an abuse amongst them, as opium-smoking in China. Its effect is to deaden sensation, and produce even madness; it has, morally, a most pernicious influence on those who take it in excess.

The Matico, or Matica, so highly esteemed in Peru, Dr. Martius believes to be a species of Phlomis. The tree grows in the interior of Peru, also on the other side of the Andes. Its leaves are said to possess marvellous medicinal properties. The preparation for use amongst the Indians is very simple, the leaf is dried and finely powdered, and the dust, sprinkled on wounds, is said to effect cicatrization very speedily. The Indians use an infusion of the fresh leaves as an aphrodisaic, and attribute to them the power of arresting arterial hæmorrhage, even if a large vessel be wounded.—*Ibid.*

BENZOIC ACID IN ELECAMPANE.

Rœttscher has found in a vessel that had contained an alcoholic extract of the Rad. Inulae, also on the cover of the vessel in which it had stood, pointed crystals of benzoic acid.—*Arch. der Pharm.* xxx. p. 169.

ON MENYANTHIN.

BY BRANDES.

The presence of colouring matter, sugar, and organic substances, soluble in alcohol, and the decomposition by heat, are the chief difficulties to contend with in the preparation of menyanthin. The following method will be found

to be the most advantageous : — an alcoholic extract is to be prepared from the juice of the plant by maceration ; the spirit is to be distilled off; the aqueous residue to be filtered and fermented with yeast, to remove the sugar; and to each pound of the herb, two ounces of an aqueous solution of oxide of lead are to be added. This will assume a yellow colour, and the fluid will appear but slightly yellow, with a greenish tint. Filter ; remove the excess of lead ; refilter and evaporate, by gentle heat (under 60°), to the consistence of an extract. This extract is to be covered with alcohol, of ninety-five per cent., and to stand for two or three days ; the brownish yellow solution is to be separated, and mixed with animal charcoal, filtered, and the spirit removed by evaporation over sulphuric acid, as distillation causes a discoloration. The yellow, pale, syrup-like mass thus obtained, is easily dissolved in water; and on the addition of more water, a separation of a few oily resinous drops ensues, which are to be removed, and the solution evaporated *in vacuo;* thus a white mass is obtained—partly crystalline, partly amorphous. Menyanthin has a bitter taste, readily becomes brown by heating with an absorption of oxygen, and is decomposed by heat, like all vegetable bitters. It is soluble in alcohol, alcoholic æther, and water, but not in pure æther. An aqueous solution is rendered turbid by alkalies, owing to the presence of salts of lime; it undergoes no change with ammonia, chloride of barium, and acetate of lead. With chloride of tin and tincture of galls it is rendered slightly turbid. With chloride of platina it forms a yellowish precipitate ; with the salts of mercury and sulphate of copper a white, and with sulphate of iron a yellowish precipitate ; the latter is sulphate of lime. Menyanthin, therefore, forms no combination with metallic oxides.—*Arch. der Pharm.* xxx., pp. 153—159.

ON RAD. GINSENG.

FROM A CHINESE COMMUNICATION, BY PROF. CALAU.

WITH NOTES BY DR. MEYER.

The Jinseng (Schinseng or Ginschen) is obtained from a species of Panax, resembling the Panax quinquefolius, probably. The name given to the plant means "human powers." It is a perennial plant growing in Mandschuria, on the Shanntan range of mountains in Dauria (?), Korea, and some parts of China, as the province San-ssi, on the north side of the hills, where it is found wild in moist places, and attains the height of from 2 to 3 feet. The root is about 2, 3, 4 inches in length, and one in thickness: it resembles the carrot. The stem is striated, without branches, and of a red colour near the root. The leaves, from four to six of which surround the stem, where they form sheaths (bracteal), are simply pennate. The leaflets, of which there are five on each leaf-stalk, are ovate, and broad at the apex, with serrated edges, reticulated, and of a pale green colour. The flower-stalk is long and green, the inflorescence a simple umbel, whose stalks are thin and of a red colour; the calyx and corolla consist of five sepals and petals (Meyer), the ovarium consists of two carpella, the style is filiform, the stamina are filiform, and have two small round anthers ; the fruit is a berry (Meyer) of a red colour, and contains two seeds of the size of mustard-seed.

The officinal part of the plant is the root. It differs in appearance according to the country from whence it is brought; in Korea and China it is white, corrugated when dry and covered with a powder resembling starch. In Mandschuria and Dauria, it is yellow, smooth, and transparent, and when cut resembles amber. The Mandschurian variety is said to be more active than the Korean, to which it is preferred, and bought at the value of gold ; it is sweetish in taste, or has a sharp aromatic taste and odour (Meyer). In Mandschuria roots are very rarely dug up, which resemble those of the mandrake, in bearing a fanciful resemblance to the human

figure. These roots are called gin-schen-gin (literally meaning a root resembling a man), these are all the property of the celestial emperor, and on being found are immediately forwarded to the court, where they are only to be met with in the possession of the higher officers of the state. The Chinese superstition, that uninterrupted good fortune will remain in a house which contains these roots, raises their value beyond that of money, and they are transmitted as a legacy from father to son. The fresh root is said to be very sensitive of atmospheric influence, by an exposure to which it loses all its medicinal properties; it is, therefore, dug up with the greatest caution, brought home hermetically sealed, and dried in an oven by gentle heat. In this process of drying, the Mandschurian variety becomes transparent.

On the Russian borders of China, in the neighbourhood of Nertschinsk, towards the source of the Amur, by the meeting of the rivers Schilka and Argun, the Mongols are said to find the root for importation into China, in which case it is probable that Ginseng may be met with in the Russian territory.

The botanist Turtschaninow has not yet been able to discover it on the Amur as far down as Albasin. The fable of its being found wild in Dahuria, is owing probably to a mistake in not distinguishing it from other roots, *e. g.* of the Stellera Chamaejasme, or Euphorbia Palasii (Meyer). In China, the Ginseng root is used as a tonic in phthisis, and all diseases arising from debility with great success; further, as a stimulant and powerful excitant in cases of depression; in fevers and inflammations it is said to be very pernicious, or even deadly. A decoction is administered by the Chinese doctors with other remedies, or in chicken and mutton broth. The Chinese assert, that patients who were unable to leave the room, after taking one dose of Ginseng, were capable of travelling from three to four werst, and that the life of a dying man may be prolonged by it for four or five days. The following is the formula according to which it is prepared for use, as communicated by a member of the Pharmaceutical Society of Lisbon, resident in Macao:—

℞ Rad. Ginseng, ℈iij.
Zingib. rec. ℈j.
Aq. font. ℥vj.

coque leni igne in balneo mariæ per horas duas tunc infunde
Cinnamomiacuti ℈j.

cola. d. s. ft. doses iij.—*Gauger's Repert.*, 1842, p. 458-461.

ACTION OF SULPHURIC ACID ON THE OIL OF POTATO SPIRIT.

The product obtained from this reaction consists, according to Gaultier de Claubry, of four substances: first, a colourless, bitter, pungent fluid, boiling at 96°, and soluble in sulphuric acid=C_{10} H_{11} O_2 (Amyl Aldehyd); second, a colourless, tasteless fluid, with a pleasant odour, boiling at 170°, and soluble in sulphuric acid, with a red colour=C_{10} H_{11} O. (Amyl Æther); third, a fluid of unpleasant odour, boiling at 160°, insoluble in sulphuric acid=C_{10} H_{10} (Amyl); lastly, a small quantity of fluid, of a strong taste, with an odour of æther=C_{10} H_{11} O_2: this is perhaps an admixture of Amyl with some other combination.—*Comptes Rendues*, xv., p. 171.

MANUFACTURE OF ROSE-WATER IN INDIA.

The rose-trees come into flower at the beginning of March, and continue so through April. In the morning early, the flowers are plucked by numbers of men, women, and children, and are conveyed in large bags to the several contracting parties for distillation; the cultivators themselves very rarely manufacture.

The native apparatus for distilling the rose-water is of the simplest con-

struction: it consists of a large copper or iron boiler well tinned, capable of holding from eight to twelve gallons, having a large body with a rather narrow neck, and a mouth about eight inches in diameter, on the top of this is fixed the head of the still, which is nothing more than an old *dekchee*, or cooking-vessel, with a hole in the centre, to receive the tube or worm. This tube is composed of two pieces of bamboo, fastened at an acute angle, and it is covered the whole length with a strong binding of corded string, over which is a luting of earth, to prevent the vapour from escaping. The small end, about two feet long, is fixed into the hole, in the centre of the head, where it is well luted with flour and water. The lower arm or end of the tube is carried down into a long-necked vessel or receiver, called a *bhudka*. This is placed in a hander of water, which, as it gets hot, is changed. The head of the still is luted on to the body, as also is the tube into the *bhudka*. The boiler is let into an earthen furnace, and the whole is ready for operation.

There is such a variety of rose-water manufactured in the bazaar, and so much that bears the name, which is nothing more than a mixture of sandal oil, that it is impossible to lay down the plan which is adopted. The best rose-water, however, in the bazaar may be computed as bearing the proportion of one thousand roses to a seer of water: this, perhaps, may be considered as the best procurable.

The boiler of the still will hold from eight to twelve or sixteen tho usand roses. On eight thousand roses, from ten to eleven seers of water will be placed, and eight seers of rose-water distilled. This, after distillation, is placed in a carboy of glass, and is exposed to the sun for several days, to become *pucka* (ripe), it is then stopped with cotton, and has a covering of moist clay put over it; this, becoming hard, effectually prevents the scent from escaping.—O'*Shaughnessy's Bengal Dispensatory*.

MANUFACTURE OF ATTAR OF ROSES.

To procure the *attar*, the roses are put into the still, and the water passes over gradually as in the rose-water process. After the whole has come over, the rose-water is placed in a large metal basin, which is covered with wetted muslin tied over to prevent insects or dust getting into it. This vessel is let into the ground about two feet, which has been previously wetted with water, and it is allowed to remain quiet during the whole night. The *attar* is always made at the beginning of the season, when the nights are cool ; in the morning early, the little film of *attar* which is formed upon the surface of the rose-water during the night, is removed by means of a feather, and it is then carefully placed in a small phial, and day after day, as the collection is made, it is placed for a short period in the sun, and after a sufficient quantity has been procured, it is poured off clear, and of the colour of amber, into small phials. Pure *attar*, when it has been removed only three or four days, has a pale greenish hue ; by keeping it loses this, and in a few weeks' time, it becomes of a pale yellow. The *attar* purchased in the bazaar is generally adulterated, mixed with sandal oil, or sweet oil ; not even the richest native will give the price at which the purest *attar* alone can be obtained ; and the purest *attar* that is made, is sold only to Europeans.—*Ibid.*

PREPARATION OF CHURRUS, OR RESINOUS EXTRACT OF INDIAN HEMP.

In Central India, and the Saugor territory, and in Nipal, *churrus* is collected during the hot season in the following singular manner :—Men, clad in leathern dresses, run through the hemp-fields, brushing through the plant with all possible violence; the soft resin adheres to the leather, and is

subsequently scraped off, and kneaded into balls, which sell at from five to six rupees the seer. A still finer kind, the *momeea* or waxen *churrus*, is collected by the hand in Nipal, and sells for nearly double the price of the ordinary kind. In Nipal, Dr. M'Kinnon informs us, the leathern attire is dispensed with, and the resin is gathered on the skins of naked coolies. In Persia, it is stated by Mirza Abdul Russac, that the *churrus* is prepared by pressing the resinous plant on coarse cloths, and then scraping it from these and melting it in a pot with a little warm water. He considers the *churrus* of Herat as the best and most powerful of all the varieties of the drug.—*O'Shaughnessy's Bengal Dispensatory.*

THE FERRUGINATED PILL OF MERCURY.

BY DR. COLLIER.

The varying and unsatisfactory quality of our "blue-pill" has for many years attracted attention. In my second edition of the London Pharmacopœia, I gave the outline of a formula for preparing it with sesquioxide of iron; the further experience of years enables me to offer this preparation as a boon to the profession and to the public, for it may be proved that the iron enters along with the mercury into the blood, and saves the wear and tear of the human body under its use. I will not at this time canvass, because I doubt, the probability of the sesquioxide (in double equivalents) yielding up one atom of its oxygen to the mercury, as is the opinion of several chemists to whom I have submitted this compound. I am aware that other peroxides, when moist, will similarly combine and divide mercurial globules; and I will not now enter upon the series of incomplete experiments instituted by myself to prove that mercury will amalgamate with other metallic oxides, and in this state form double or triple salts with acids. I shall now keep only to the practical utility of my compound, and to its importance as a great remedial improvement.

The following is the formula:

℞ Ferri sesquioxydi, ʒj,
Hydrargyri, ʒij,
Confect: Rosæ Gallicæ, ʒiij.

Contere donec globuli non amplius conspiciantur.

It is made in five minutes; common blue-pill demands a week. The globules are not visible, even by the microscope. It is uniform in its appearance and effects. It makes a smoother pill, retaining its form more permanently. It salivates in a few days in the usual doses. It is particularly eligible for the strumous, the irritable, and for reduced anemial constitutions requiring mercury. The powers of life are not so much (scarcely at all) prostrated under its use. Its resolvent power is greater than that of mercury alone, especially with respect to buboes. Practitioners will at all events know what they are using; at present they have for blue-pill all manner of alloys and sulphurets—mercurial-zinc pill, mercurial-sulphur pill, &c. &c.

Five grains of the sesquioxide will suffice to amalgamate and divide a large quantity of mercury, but I propose the larger proportion as a remedy.—*Lancet*, March 11th, 1843, page 880.

[The facility with which mercury may be reduced to a state of minute division by means of vegetable extracts, has already been pointed out in this Journal, vol. i., page 203, the time required for this purpose varying from ten minutes to half an hour, according to the nature of the extract employed. The therapeutic value of Dr. Collier's preparation, as detailed in the above paper, entitles it to the consideration of the profession, as a new remedy, but we cannot recommend the use of any succedaneum in the preparation of the blue pill of the Pharmacopœia. A strict adherence to the order of the college produces a result uniform in strength and appearance.—Ed. Pharm. Journal.]

REVIEW.

PHARMACOLOGIA; *being an Extended Enquiry into the Operations of Medicinal Bodies, upon which are founded the Theory and* ART OF PRESCRIBING. By J. A. PARIS, M.D. Cantab., F.R.S., Fellow of the Royal College of Physicians of London, and late Senior Physician to the Westminster Hospital. Edition the Ninth. *Re-written in order to incorporate the latest Discoveries in Physiology, Chemistry, and Materia Medica. London: Samuel Highley, 32, Fleet Street,* 1843.

THE reputation of this work has been so long and so firmly established by the able manner in which the author has treated of the varied subjects which it includes, that it will be superfluous to enter into a minute analysis of it; we shall, however, point out some particulars in which the present edition differs from those that preceded it, and make a few extracts, which we trust will both instruct and entertain the reader. In the preface, Dr. Paris observes,

"We may now be said to possess works, whose authors have collected the scattered rays which emanate from every department of the sciences, in order to illustrate the objects of their study. The Materia Medica of Pereira, and the Dispensatory of Christison, lie on the table of every intelligent practitioner without a rival; so complete and accurate do I consider the 'Special Pharmacology,' that I shall for the future abstain from republishing the second part of my work, which through eight editions has been devoted to its investigation; and for this omission I offer the compensation of a much more extended view of that province, which I must continue to regard as peculiarly my own, for no author of the least repute has hitherto invaded it—THE PHILOSOPHY OF MEDICINAL COMBINATION—from which alone can be deduced the THEORY AND ART OF PRESCRIBING."

Among the various cogent reasons for the complete re-writing of the work, Dr. Paris mentions the rapid and extraordinary advancement of every branch of science during the last ten years—an advancement which has rendered the very language of the Pharmacologia obsolete. The appearance of a new Pharmacopœia, enriched with newly-discovered substances, and a nomenclature radically changed, are adduced as additional causes for the re-appearance of the work in a new form.

One of the most important additions to the work is entitled, "A Synopsis of Substances usually considered as incompatible with the different articles of the Materia Medica, and of the results of their mutual actions." We may here observe, that the title of this chapter is more limited than its facts, or rather it is somewhat incorrectly stated; for the substances experimented upon are in general, and in by far the greater number, preparations of the Pharmacopœia, instead of mere articles of the Materia Medica; the modes by which precipitation, re-solution,

solution, and volatilization are expressed by the position of the arrow, render the effects produced perfectly intelligible without any unnecessary repetition. So complete, or, perhaps, we ought to say, so numerous a collection of medicinal re-agents never before appeared. Some of the effects stated to be produced appear to be at variance with what some authors have previously mentioned; but these discrepancies, we trust, a very short period will be sufficient to explain, or to correct, if necessary.

As a new portion of the present work, we ought not to omit noticing Dr. Paris's remarks on homœopathy, which are very conclusive. We need only quote one passage, which relates to the amount of a homœopathic dose of medicine.

"The millionth part of a grain of many substances is an ordinary dose; but the reduction proceeds to the *billionth*, *trillionth*, nay, even to the *decillionth* portion of a grain! Now, let us ask whether it has ever occurred to the reader to imagine a quantity represented by a decillion? if not, we will enlighten him upon this point. Suppose then, that every inhabitant upon the face of the globe were to take this homœopathic dose every second of time, six thousand years must elapse before a single grain could be consumed!"

We give the following chapter entire, as the subject is one which comes especially within the province of the Pharmaceutical Chemist; we hope, for the credit of our profession, that the extended education which is now contemplated will effectually diminish, if not remove, the sources of complaint:

"THE IGNORANT PREPARATION, FRAUDULENT ADULTERATION, AND SPONTANEOUS DETERIORATION OF MEDICINES.

"The circumstances comprehended under this head certainly deserve to be ranked amongst the most powerful causes which have operated in affecting the reputation of many medicinal substances. The Peruvian bark fell into total discredit in the year 1799, from its inability to cure the ague; and it was afterwards discovered to have been adulterated with bark of an inferior species; indeed, Sydenham speaks of its sophistication before the year 1678, and tells us that he never used to exceed two drachms in the cure of any intermittent, but that, of late, the drug had become so inert, rotten, and adulterated, it became necessary to increase its dose to one, two, or even three ounces. Very few practitioners have an idea of the fatal extent to which this nefarious practice is carried on, or of the systematic manner in which it is conducted. There can be no doubt but that the sophistication of medicines has been practised in degree in all ages;* but the refinements of chemistry have enabled the manufacturers of the present day, not only to execute such frauds with greater address, but unfortunately at the same time to vend them to the public with less chance of detection. It will scarcely be credited when I state that many hundred persons are supported in this metropolis by the art of adulterating drugs, besides a number of women and children who find

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"* Dr. Murett, in his 'Short View of Frauds and Abuses' (A. D. 1669), charges the apothecary with 'falsifying medicines;' 'They showed the censors,' says he, '*myrtle leaves* for *senna*; a *binder* for a purger; *mushrooms*, rubbed over with chalk, for *agaric*; *hemlock* for *pœony*; *sheep's lungs* for *fox's lungs*; and the bone of an *ox's heart* for that of a *stag's heart*.'"

ample employment and excellent profit in *counterfeiting* cochineal with coloured dough; peppercorns with peas-meal; isinglass with pieces of bladder and the dried skin of soles; and in filling up with powdered sassafras the holes which are bored in spice and nutmegs, for the purpose of plundering their essential oils. In fact, an account of the various methods employed for adulterating the articles of the Pharmacopœia would occupy a volume. The colleges of London and Edinburgh, fully sensible of this increasing evil, have added short notes, by which the purity of the leading medicines may be ascertained. Nor is ignorance less to be feared than fraud; every person of the least experience must know that the credit of a remedy continually suffers from the ignorance of those who prepare it.

"With regard to the deterioration which many articles undergo by having been too long kept, I would observe that, although no honest practitioner would retain in his service such organic products as have undergone an obvious change, still he may not be aware of the nature and extent of those alterations which spontaneously take place in the composition and consequently in the virtues, of many vegetable preparations; the influence of air, and above all *light*, in producing changes upon green vegetable powders, is not generally understood; in daylight the green matter absorbs carbonic acid, and emits oxygen; while in the dark a chemical action of a different nature takes place, the leaves and green parts containing volatile oils, or volatile constituents, absorb oxygen, and are thus converted into resin; and these changes are wholly independent of vitality. I shall show hereafter that certain saline additions to vegetable matters will occasion decompositions, of which the latter in their unmixed forms are not readily susceptible; at the same time it will appear that vegetable matters will frequently occasion essential changes in the composition of the salts with which they may be associated. The subject offers to the pharmaceutist many important points for further investigation; and to those desirous of pursuing it, I strongly recommend the work of Professor Liebig 'On Organic Chemistry,' and I would more particularly direct attention to that class of phenomena, to which he has given the name of '*Eremacausis*,' or slow combustion. His researches and reasonings claim an importance not to be surpassed by that of any chemical inquiry of the present day."

Dr. Paris appears, however, to differ from Professor Liebig on some points; as, for instance, in his theory respecting animal heat, which the Doctor attributes, in a great degree to "vitality" and "nervous influence," instead of ascribing it to combustion or chemical action. This subject is so abstruse, that we leave time and our readers to decide as to the merits of the respective theories.

NOTICES OF BOOKS RECEIVED.

A Grammatical Introduction to the Pharmacopœia, *and a Key to* Physicians' Prescriptions; *containing a Latin Grammar, a Synthetical Analysis of the Pharmacopœia. and Preface, and a copious Vocabulary.* By S. F. Leach, Classical Professor, &c. 12mo, pp. 260. Third Edition. *London: H. Hughes, St. Martin's-le-Grand.*

To those apprentices who have not had the advantage of a good classical education, we can recommend this work as a

means of acquiring a certain amount of knowledge of the Latin language, without which they are not qualified to undertake the preparation of Physicians' prescriptions. It is also adapted for those who have not left school, and to whom this preliminary instruction is likely to be useful, by preparing their minds for the study of their future profession.

MANUAL OF DISEASES OF THE SKIN, *from the French of MM. Cazenane and Schedel, with Notes and Additions.* By THOMAS H. BURGESS, M.D., Surgeon to the Blenheim Street Dispensary for Diseases of the Skin, &c. 12mo, pp. 320. *London: Henry Renshaw, 356, Strand. Edinburgh: Maclachlan and Stewart. Dublin: Fannin and Co.*

THE reputation of the work of which this is a translation is too well established to require any additional praise. The subject is one which is not exactly suited to our pages, with the exception of the catalogue of remedies at the end of the volume, which may be interesting to our readers, by showing the contrast between French Pharmacy and that of our own country.

OBSERVATIONS ON THE EXTRACTION OF TEETH, *with plates.* By J. CHITTY CLENDON, *Surgeon-dentist.* 12mo, pp. 80. *London: S. Highley, 32, Fleet Street.*

THE chief object of Mr. Clendon appears to be, to point out the danger and disadvantages attending the use of the key instrument, and to describe the kinds of forceps which are best adapted for the purpose, with the mode of using them. The whole subject is well treated, and the work contains much useful information in a small compass.

OBSERVATIONS ON THE PRINCIPAL MEDICAL INSTITUTIONS AND PRACTICE IN FRANCE, ITALY, AND GERMANY, *with Notices of the Universities and Climates and Illustrative Cases.* By EDWIN LEE, M.R.C.S., &c. &c. 8vo, pp. 269. *London: J. Churchill, Princes Street.*

We can recommend this volume to those who take an interest in the history and improvement of the profession, but our space does not admit of a detailed analysis at present.

LECTURES ON CHEMISTRY. By HENRY M. NOAD.

THE twelfth and concluding lecture of this series being now published, we may congratulate the author on having fulfilled his engagement, to give a brief outline of the science of Chemistry, neither too trite to be instructive, nor too scientific to suit the

general reader or juvenile student. As a means of exciting an interest in the study of Chemistry, by unfolding some of the leading features of the science, and explaining the modern views of the most eminent of its professors, we think this little work calculated to be very useful.

PROVINCIAL SCHOOLS OF PHARMACY.

The necessity of adopting some measures for promoting an improved system of education among the rising members of our body, not only in London but in all parts of the country, appears to be generally felt and acknowledged. In small towns where the numbers are too limited to admit of the establishment of courses of lectures, recourse must be had to such books as are within the reach of the student, and in the selection of these works, as well as in the arrangement of a plan of study, the periodical communication which takes place among the members of the society is likely to be found essentially useful. But in large towns, greater facilities exist for the diffusion of knowledge, and we are glad to find a disposition springing up in many places, to follow the example of the Chemists in London, by establishing branch Schools of Pharmacy.

The lectures on Pharmaceutical Chemistry, by Mr. Davies at Manchester, are well attended, and appear to give general satisfaction. The number of pupils amounts to between forty and fifty, which, in comparison with the number of members and associates in that district, exceeds the ratio of the students in the metropolitan school. (This circumstance should act as a stimulus to our students in London.) It is at the same time satisfactory to find that the encouragement thus given to education in the country, is such as to leave no doubt as to the propriety of persevering in the experiment.

A course of lectures has already been delivered at Bristol by Mr. Thwaites, and arrangements are now in progress for the delivery of a course of lectures on Chemistry by Mr. Herapath.

We have received a communication from the secretary at Bath, intimating a desire, on the part of the members and associates in that district, to arrange for the delivery of lectures on Chemistry and Pharmacy.

Similar intimations have been made by some of our brethren at Liverpool, Newcastle, Norwich and Birmingham, and we trust the time is not far distant, when these and other branches of our Institution will be provided with some public means of instruction for students in Pharmacy.

The manner in which this is to be effected, requires mature consideration. It is evident that the number of country schools must be limited, since no institution of this kind could flourish without a certain number of pupils. The amount and description of assistance afforded by the Council to such measures must also be regulated on fair and equitable principles, and must be dependent on the state of the funds of the society. In some places, facilities may exist for adopting the lectures of a medical school, in others it may be found necessary to establish separate courses for our students. In these and other particulars, a variety of circumstances must be considered, and whatever plans are adopted should not be decided on without the most mature deliberation. Our object is to establish an effectual and permanent system of education, in effecting which object, no contingency should be overlooked; and whatever plans are proposed, must be considered, with reference not merely to any particular locality, but to the general interests and requirements of the society at large. We are not yet prepared to go into the details of the subject, but allude to it on the present occasion in consequence of the communications which we have received from correspondents in the country; being anxious to promote Pharmaceutical Education by every means in our power, and at the same time to point out the necessity of considering so comprehensive a question in all its bearings.

THE SYDENHAM SOCIETY.

Among the numerous institutions to which the march of intellect has of late years given rise, we may be allowed to introduce to the notice of our readers

"The Sydenham Society, which has been founded for the purpose of meeting certain acknowledged deficiencies in the diffusion of medical literature, which are not likely to be supplied by the efforts of individuals. It will carry this object into effect by distributing among its members:—Reprints of standard English medical works, which are rare and expensive; miscellaneous selections from the ancient and from the earlier modern authors, reprinted or translated; digests of the most important matters contained in old and voluminous authors, British and foreign, with occasional biographical and bibliographical notices; translations of the Greek and Latin medical authors, and of works in the Arabic and other Eastern languages, accompanied, when it is thought desirable, by the original text; translations of recent foreign works of merit; original works of great merit, which might be very valuable as books of reference, but which would not otherwise be published, from not being likely to have a remunerating sale—such as classified Bibliographies, and alphabetical Indexes to periodical publications and other valuable voluminous works.

"The Society will consist of an unlimited number. The subscription

constituting a member is one guinea annually, for which he will be entitled to a copy of every work printed by the Society during the time of his subscription. The subscriptions are to be paid in advance; and no member is responsible beyond the amount of his subscription. All works published by the Society will be selected by the Council; and, previous to publication, will be subjected to their supervision. The Society will not commence its operations until the number of its members amounts to five hundred. The works of the Society will be printed for members only; on a uniform plan, and with a good legible type. The Society will be under the direction of a council of twenty-four members, elected at the annual general meeting from the subscribers at large; and of this number eighteen only will be re-eligible for the following year. The president and vice-presidents will also be elected annually. As the expense of management will be very small, nearly the whole of the funds subscribed will be devoted to the publications; and as the proportionate cost of producing books decreases as the number of copies increases, it is anticipated that, when the Society is fully organized, the annual supply of works to members will be considerable."

Some of the most eminent members of the profession are among the managers of this society; and when we take into consideration the importance of its objects, and the extended field of scientific research which lies before it, we have every reason to anticipate much benefit from its institution under such favourable auspices. The subscription is moderate, and every member who is interested in medical literature may expect to receive the full value for his money.

THE SALE OF SPIRITS OF WINE.

In our last nnmber we briefly noticed the proceedings of the Commissioners of Excise in reference to recent informations against Chemists and Druggists for selling spirits of wine, and the result of an interview granted to a deputation on behalf of the Trade. We regret to state, that the penalties, although mitigated, have been enforced to the extent of ten guineas in all the cases in which fines had been levied. The Council of the Pharmaceutical Society held a special meeting on Tuesday, March 21st, for the purpose of taking the subject into consideration, and the Solicitor of the Society attended for the purpose of affording such information as might be required respecting the interpretation of the law. A memorial has been drawn up for presentation to the Lords of the Treasury; but the necessity of going to press prevents our reporting the result in the present number.

To give our readers an idea of the extreme difficulties attending the question, and the peculiarly embarrassing position in which Chemists and Druggists are placed, we give, according to promise, the

EXTRACTS FROM THE ACTS OF PARLIAMENT.

9TH GEORGE II., CAP. 23.

SECTION 1.

WHEREAS the drinking of spirituous liquors or strong waters is become very common, especially among the people of lower and inferior rank, the constant and excessive use whereof tends greatly to the destruction of their healths, rendering them unfit for useful labour and business, debauching their morals, and inciting them to perpetrate all manner of vices; and the ill consequences of the excessive use of such liquors are not confined to the present generation, but extend to future ages, and tend to the devastation and ruin of this kingdom; for remedy whereof, may it please your Most Excellent Majesty, that it may be enacted by the King's Most Excellent Majesty, by and with the advice and consent of the Lords Spiritual and Temporal and Commons in this present Parliament assembled, and by the authority of the same, That from and after the 29th day of September, A. D. 1736, no person or persons whatsoever, shall presume, by him, her, or themselves, or by any other person or persons whatsoever, employed by him, her, or them, or for his, her, or their benefit, to sell or retail any brandy, rum, arrack, usquebaugh, geneva, aqua vitæ, or any other distilled spirituous liquors or strong waters, unmixed or mixed with themselves, or any other ingredients, and by whatsoever name or names they are or may be called, publicly or privately, in any less quantity than two gallons, without first taking out a licence for that purpose as is hereinafter directed, within ten days at least, before he, she, or they shall sell, or offer to sell or retail the same, for which, he, she, or they, shall immediately upon taking out thereof, pay down for the same, the sum of £50 in manner following, that is to say, If such licence be taken out within the limits of the penny post, then the same shall be paid at the Chief Office of Excise in London, or at any other place, and to such persons as his Majesty's Commissioners for the duties of Excise for the time being shall appoint to receive the same; and that such persons as by the said Commissioners shall be appointed, are hereby empowered to deliver such licences to any such person or persons, upon his, her, or their paying down for the same, the aforesaid sum of £50 at the time of taking out thereof; but if such licence shall be taken out without the limits aforesaid, then the same shall be paid by all and every the persons so taking out such licence at the office of Excise, next adjoining the place where he, she, or they respectively reside or inhabit, or at any other place, and to such persons as his Majesty's Commissioners for the duties of Excise for the time being shall appoint to receive the same; and such persons as by the said Commissioners shall be appointed, are hereby empowered to deliver such licences to any such person or persons, upon his, her, or their paying down for the same, the aforesaid sum of £50 at the time of taking out thereof.

SECTION 2.

AND BE IT FURTHER ENACTED by the authority aforesaid, That every person or persons that shall take out such licence as aforesaid, is and are hereby required to take out a fresh licence, ten days at least before the expiration of twelve months after the taking out of the first licence, before he, she, or they do presume or offer to sell any such spirituous liquors in any less quantity than two gallons; and in the same manner to renew such licence from year to year, paying down the like sum of £50 for each and every new and renewed licence, at the places and at the times before mentioned; and if any person or persons shall presume or offer to sell or retail any of the said spirituous liquors, in any less quantity than aforesaid,

without taking out such licence and renewing the same yearly as in manner aforesaid, he, she, or they, shall respectively forfeit and lose the sum of £100 for each offence.

SECTION 6.

AND BE IT FURTHER ENACTED by the authority aforesaid, That every person or persons who, after the said 29th day of September, 1736, shall sell or offer to sell or retail any spirituous liquors or strong waters, by whatever name or names they are or may be called, in any less quantity than two gallons, shall at least ten days before, he, she, or they, shall sell or offer to sell by retail any such spirituous liquors or strong waters, make a true and particular entry in writing, of all warehouses, storehouses, shops, cellars, vaults, rooms, or other places whatsoever, by him, her, or them, respectively used, or intended to be used, for the laying, keeping, or retailing, any of the said spirituous liquors or strong waters, at the next office of Excise, within the limits wherein such warehouses, storehouses, shops, cellars, vaults, or other rooms or places shall be situated, and also of all spirituous liquors or strong waters, by whatever name or names they are or may be called, which at the time of making such respective entries, or which at any time after shall be in such warehouses, storehouses, shops, cellars, vaults, rooms, and other places, and every of them respectively, upon pain of forfeiting the sum of £20 for every such warehouse, storehouse, shop, cellar, vault, room, and other place which shall be so made use of by such retailer, and 40*s*. for every gallon of such spirituous liquors or strong waters, which shall be concealed and not entered as herein is directed, together with all the spirituous liquors or strong waters, which shall be found therein or concealed as aforesaid, and the casks and other vessels containing the same.

SECTION 10.

AND WHEREAS many persons concerned in trade, "who employ great numbers of journeymen, workmen, servants, labourers, and other artificers, deal in spirituous liquors, and retail the same at excessive rates to persons working under them :" BE IT FURTHER ENACTED by the authority aforesaid, That from and after the said 29th day of September, 1736, no licence shall be granted to any person or persons whatsoever, for selling by retail any spirituous liquors or strong waters whatsoever, except to such persons only who shall keep public victualling houses, inns, coffee-houses, alehouses, or brandy shops, and use or exercise no trade whatsoever; and if such licences shall be granted, the same are hereby declared void to all intents and purposes.

SECTION 12.

Provided always, That this act shall not extend to any Physicians, Apothecaries, Surgeons, or Chemists, as to any spirits or other spirituous liquors which they may use in the preparation or making up of medicines for sick, lame, or distempered persons only.

16TH GEORGE II., CAP. 8.

SECTION 11.

Provided, and it is hereby agreed, That nothing in this act shall extend or be construed to enable any person or persons to sell any spirituous liquors or strong waters by retail, unless such person or persons be first licensed to sell ale or spirituous liquors, by two or more of his Majesty's justices of the Peace for the county, riding, city, division or liberty, wherein such person or persons shall sell the said liquors, under the hands and seals of the said justices.

SECTION 12.

Provided always, and be it enacted by the authority aforesaid, That this act or any thing therein contained, shall not extend to any Physicians, Apothecaries, Surgeons, or Chemists, as to any spirits or spirituous liquors, which they may use in the preparation or making up of medicines, for sick, lame, or distempered persons only; and that no person or persons shall be deemed or taken to be a retailer of spirituous liquors, who doth not by him, or herself, or themselves, or by his, her, or their servant, or other person, retail the same to be drank or consumed, in his, her, or their warehouses, storehouses, shops, cellars, vaults, rooms, sheds, or other places, to him, her, or them belonging, or that shall otherwise retail or send the same abroad out of their said warehouses, storehouses, shops, cellars, vaults, rooms, sheds, or other places, in less quantities than one pint.

We also quote the following

EXTRACT FROM THE PHARMACOPŒIA,

which is also sanctioned by Act of Parliament, and which every Chemist and Druggist is bound by law to obey, by which it is his duty to prepare the various compounds and articles of the Materia Medica, required by the public.

Spirit of wine, which is alcohol diluted with water, is employed in Pharmacy for various important purposes, and of different degrees of strength, according to circumstances. In its concentrated state, it is termed *alcohol*, and is prepared by the process stated below ; when diluted with a small proportion of water, it is called *rectified spirit*, and when more largely diluted, *proof spirit*, these are articles of the Materia Medica.

These three preparations are defined, and recognized by their specific gravity, a test which the Chemist and Apothecary are obliged to attend to, in obedience to the College of Physicians, the authority of which body is not in like manner imperative upon any other class.

Consequently, whenever the public requires any one of these preparations, recourse must be had to the Chemist or Apothecary, who alone is expected to obey the instructions of the Pharmacopœia, and whenever the Chemist or Apothecary fulfils his duty by supplying the article in a state of purity in obedience to the law relating to the College, he is liable to a penalty under the provisions of the law relating to gin-shops. This anomaly is obviously at variance with the intentions with which the Acts were framed, and we therefore trust that a representation of the facts of the case in the proper quarter will be attended with a favourable result.

A VERY GENERAL PRACTITIONER.

On a cottage window, near Plymstock, is the following :

"I ——— Parish Clarck Seargeant, Smith, tacheth yong Garls and Bouys to rade and rite daleth in mole candals shugar plums rish-lites comes, mole traps, mouse traps, spring guns, and all other sich maters — teeth distracted, blid drawn, blisters, Pils, mixturs maid, also nails, and hosses shoed, hepsome salts, and cornes cut, and all other things on rasonable Tarmes. — *N.B.* and also my Misses goes out as man whidwife in the cheepest way posuble."— *Dublin Medical Press*, March 22d, 1843.

TO CORRESPONDENTS.

An advertisement from Newcastle and Sunderland, respecting a proposed alteration in one of the Laws of the Society, was received last month, but was not inserted, in consequence of a misunderstanding, which has been explained to the Secretaries of the above places: the advertisement has subsequently been withdrawn.

"An Irishman," (Cork) states, that in making the lin. saponis cum opio, P.L., a crystalline precipitate is thrown down, a specimen of which he has sent, wishing to know what it is. We have never observed this phenomenon to take place. The precipitate, on a cursory examination, appears to consist of stearine, with a small proportion of an alkaline meconate, and probably depends on the quantity of free acid in the tincture of opium, and the alkaline state of the soap in the linimentum saponis. It is not likely to affect the efficacy of the remedy.

A. B. C. Dr. Thomson informs us that he has obtained the alkaloid Hyoscyamia, but has not used it therapeutically, except in the way of experiment, which did not encourage him to introduce so expensive a medicine.

The second and third questions involve chemical analyses, which we have not had time to undertake.

Mr. Barry's experiments have been superseded by a paper, published in Vol. II., number vi., page 411, of this Journal.

Nitrate of silver is prepared in very small sticks for cases, but it is not less brittle than when in sticks of the usual size.

For the mode of purifying animal charcoal, see the Pharmacopœia.

"A Subscriber." Nitro-muriate of iron is identical with sesquichloride of iron, a tincture of which is ordered in the P. L.

"Minimo Minor."—Gold may be obtained in a state of purity from a solution of it containing copper, by evaporating the solution to dryness, dissolving the residue in water mixed with hydrochloric acid, and then adding protosulphate of iron, when the gold will be precipitated as a brown powder.

The *Ferro-sesquicyanuret of potassium* is a name which has sometimes been given to the salt known as *prussiate of potash.*

"Francisco."—We should not anticipate spontaneous combustion from the mixture described. It may be well not to expose it to the action of light, nor to keep it in a very warm place.

"Inquisitor."—Oxide of manganese may be dissolved in hydrochloric acid. We have not seen any formula for ink in which this is one of the ingredients.

Q. E. D.—Mezereon bark should be used in the dry state, as it is usually found in the shops.

J. W. E. Evaporating *in vacuo*, or at a moderate temperature, is the best method of concentrating compound decoction of sarsaparilla. A small quantity of spirit is generally added to preserve it.

H. W. The adulteration of powdered ginger with wheat-flour, may be detected by the microscope, the shape of the particles of wheat starch being very different from those of ginger starch.

Θ. When drops are ordered in a prescription, drops and not minims should be used. When the size of a plaster is denoted on a prescription, this should be understood not to include the margin, unless two lines be drawn.

E. B. A solution, and a tincture of acetate of iron, are ordered in the Dublin Pharmacopœia. The former is called Ferri Acetas.

J. L. M. (Bath). See Vol. II., No. 8, page 554.

"An Associate." We cannot recommend any deviation from the Pharmacopœia in making Pil. Galban. co. See page 652

"An Associate," (Congleton). Dr. Daubeny's Introduction to the Atomic Theory, published by Murray, Albemarle Street.

"A Member," (Manchester) states, that he has observed, in making compound tincture of cardamoms, a deposition of the colouring matter, which he has in vain attempted by various expedients to prevent. *Query:* has our correspondent used an iron press?

Mr. Harwood, Jun., has sent a formula for making citrate of iron, with a sample, which consists chiefly of sulphate of iron, and has no resemblance to the citrate.

G. L. We are not aware of the existence of any Provident Society for Druggists' Assistants. The Benevolent Fund of the Pharmaceutical Society is intended to answer this purpose.

N. should study the Latin language, to which there is no royal road.

"Adolescens" is refered to Vol. II., No. 3, the Notice inside the cover. The names of candidates who fail in passing the examination are not published.

"An Associate." It is optional with all parties whether they continue to belong to the Society or not: those who cease to subscribe, are no longer entitled to any benefit from the Institution, and cannot be re-admitted without paying a fine.

W. R. No Apprentice or Associate can be admitted without examination. See Notices on the covers of Vol. II., Nos. 2 and 3.

Z. Z. Z. The amount of subscription for Apprentices and Associates is the same, but the examinations are different. See the above-mentioned Notices.

W. L. L. (Norwich). Every Member of the Society is entitled to the Certificate of Membership.

Mr. Hamond suggests, that in order to ensure uniformity in the charges for prescriptions, the prices should be affixed in figures instead of the private mark. We doubt whether this plan would be any improvement.

"A.P.S." (Bath), J. H. (Liverpool), "Medicus" (Whitehaven), *see* the Leading Article of this number.

V.P., M.P.S., mentions several facts which have occurred in his own experience, proving the danger to which the public is exposed from Dispensing Chemists serving on juries, and leaving their shops under the care of apprentices or errand-boys. We hope a remedy will be found for this evil.

In preparing black ink, *cold* water answers the purpose.

Varnish-making is a distinct business, in which we have little or no experience; but we believe copal varnish is generally used for gold labels.

The addition of a small quantity of camphor to spirits of wine, for the purpose of evading the law, is not a safe or correct practice. Any intentional evasion of the law is considered by the commissioners an aggravation of the offence.

Several Correspondents who have made enquiries respecting the sale of spirits of wine, are referred to page 671.

J. M. wishes to know, whether it be the intention of the Council to call the Society the ROYAL Pharmaceutical Society of Great Britain? This question has not been decided. It has been the desire of the Council, in the first instance, to make the Society worthy of the title.

Advertisements to be addressed to Mr. Churchill, Princes Street, Soho.

Other Communications to The Editor, 338, Oxford Street (before the 20th of the month, if answers be desired in the ensuing number).

THE

PHARMACEUTICAL JOURNAL.

VOL. II.—No. XI.—MAY 1st, 1843.

MEDICAL REFORM.

The objects to be attained by medical legislation are, first, to provide the public with qualified practitioners in every department; secondly, to secure to such persons a fair and proportionate amount of remuneration for their labour and skill; thirdly, to restrain ignorant pretenders from doing mischief. That these advantages are not enjoyed in this country is too well known to require demonstration, and numerous attempts have been made, especially of late years, to bring about the desired reformation.

But unfortunately the profession is divided against itself. As soon as one party proposes a scheme, and introduces a bill into Parliament, another party commences a violent opposition, and the bill is thrown out. The other party advocates a different measure, which is opposed by the first; fresh schemes are concocted and share the same fate. Thus years roll on—a great deal is said and written on the snbject, but little or nothing is done.

At length the members of the government, finding that the profession is unable to legislate for itself, have undertaken to perform the task, and a Medical Bill is shortly expected to appear, under the auspices of the Secretary of State. It is not for us to discuss Medical Reform in all its bearings, we shall therefore confine our remarks to that portion of the subject which relates to Pharmacy.

It is obvious, that if education be requisite in the prescriber, it is equally so in the person who prepares the remedy, and although the nature of the education in the two cases may differ, as of course it does, the amount should be the same, and the performance of the two offices should be placed under similar restrictions. It would be absurd to lay great stress on the importance of science and skill in writing the prescription, and at the same time to leave the preparation of it to chance. We may therefore conclude that some provisions, with reference to Chemists and Druggists, will be comprised in the Medical Bill, and it is our duty to exert ourselves at the present crisis in establishing our own department on a creditable foundation.

This should not be considered a party question. In advocating a distinct system of education aud examination, and desiring to superintend and manage the same, we are claiming no more than is enjoyed by other bodies. As long as we confine our measures to the regulation and improvement of ourselves, we have no reason to fear any opposition; on the contrary, we are entitled to the support of the medical bodies in carrying out a plan in the success of which the whole profession is interested. But we must not forget that, in order to succeed in this undertaking, we must be united among ourselves—we must merge all minor considerations and party feelings in the attainment of the one grand object, which involves our professional character and independence.

When the question comes before Parliament, we must be prepared to support the views which our experience has shown to be correct, and the public utility of which has been demonstrated and pointed out. It is not by clamorous disputation, and a selfish or inconsiderate application for personal privileges, that we can hope to carry our point; but by a steady and persevering appeal to common sense, and a temperate exposition of the principles which we advocate. By the former course we should excite jealously and provoke opposition; by the latter, we may

hope to prove the justice of our claims, and the public advantage of what we desire to accomplish.

Until the PHARMACEUTICAL SOCIETY was established, no means existed for effecting the organization of our body without the intervention of others, and in all the plans which were contrived for this purpose, it was proposed to constitute a governing and examining board in which we were to take no part. A nucleus is now formed: we are recognized as a body corporate and politic—we have arranged our plan of education and examination, and by this means we have not only relieved others from the necessity of interfering, but entered upon the management of our own affairs.

But notwithstanding all that has been done—notwithstanding the progress which we have made during a short period of time, it is absolutely necessary to persevere, in order to complete the work which we have commenced. If we relax in any degree, if our members fall off, if we depart from that unity of purpose which has hitherto characterized our proceedings, we may even fall back into a worse position than we were in before we commenced operations. The necessity of some effectual measures for the improvement of our body is no longer disputed, and since we have ourselves laid the foundation of this improvement, the other branches of the profession, being interested in the result, are not likely to observe a failure of our undertaking with indifference, but will naturally take the matter out of our hands if we prove incompetent to the task.

A catastrophe like this would involve our body in lasting disgrace, and we have only alluded to the possibility of its occurrence, in order to point out in the most forcible manner the responsibility of our present position, and the cogent reasons which should induce us to take upon ourselves the duty of *providing the public with qualified practitioners* in Pharmacy. When we have (as far as regards our own department) attained this, which has been stated as the first object of medical legisla-

tion, we may fairly claim for such practitioners an *adequate remuneration* for their labour and skill, which involves, in some degree, the *restraint of ignorant pretenders.*

One of the most pressing evils which the trade is at present suffering, is the depreciation of prices; which is occasioned chiefly by the inroads of persons entirely destitute of proper education, with whom it is ruinous to compete, and who are, nevertheless, in many cases, formidable rivals. If there existed an obvious line of demarcation between these persons and duly qualified Chemists—if the public had any correct means of estimating the comparative merits of the two classes, the huxter would lose his trade, although he might offer drugs for sale at less than half-price. This, then, would be a moral restraint upon the unqualified, and an indirect means of ensuring to recognised Chemists and Druggists a more ample reward for their labour. Other restraints and prohibitions might be enacted, but this could not be done effectually until the distinction is completely established. The tares must be separated from the wheat, before the threshing is commenced.

The Pharmaceutical Society is gradually accomplishing this separation. In such cases a sudden revolution would be impossible; but we ought to advance steadily, though cautiously, regardless alike of the sneers of those who blame us for doing too little, and the taunts of others who would impede our progress by accusing us of going too fast

TRANSACTIONS
OF
THE PHARMACEUTICAL SOCIETY.

LECTURE II.

ON THE POLARIZATION OF LIGHT, AND ITS USEFUL APPLICATIONS.

BY JONATHAN PEREIRA, M.D., F.R.S.
Honorary Member of the Pharmaceutical Society.

[CONTINUED FROM OUR LAST NUMBER, PAGE 637].

2. WAVE HYPOTHESIS OF LIGHT.

There are two hypotheses or theories which have been formed to account for the phenomena of light; one of these is called, the *projectile theory*, or the *theory of emission*;—while the second is denominated the *wave*, or *undulatory theory of light.*

The first is sometimes called the *material* or *Newtonian theory* of light. But as on both hypotheses a fine subtile form of matter is required to account for luminous phenomena, the one hypothesis equally deserves the name of *material* with the other. Moreover, I cannot understand why the projectile theory is to be exclusively honoured with the name of the *Newtonian*; for though on some occasions Newton certainly adopts it, yet on others he appears to support the theory of waves.

On the present occasion it is not my intention to enter into any details respecting the projectile theory; for however ably and plausibly it accounts for some optical phenomena, it is manifestly incompetent to explain those which it is the object of this course of lectures to describe.

Light, a Property or Motion.—The wave-theory supposes that light is a *property*—a *motion*—a *vibration* of something. But of what? Euler imagined that the vibrating medium, in dense bodies, was the body itself; through the gross particles of which he supposed the light to be propagated in the same manner as sound. This hypothesis, Dr. Young* declares to be "liable to strong objections;" and he adds, that "on this supposition, the refraction of the rays of light, on entering the atmosphere from the pure ether which he describes, ought to be a million times greater than it is."

Ether.—To account for the phenomena of light, philosophers have assumed the existence of a vibrating medium, which has been called *the etherial medium*, the *luminiferous ether*, or simply

* *A Course of Lectures on Natural Philosophy*, vol. ii., p. 542. Also *Phil. Trans.* for 1800.

ether. It is supposed to be a rare, highly elastic, subtile fluid, which occupies all space and pervades all bodies. As the sensation of light is supposed to be excited by the undulations of this medium, so, where light exists, there ether must be. Hence it fills all space. It is between the sun and the earth, the earth and the stars, and so on. If it did not exist in water, diamonds, glass, &c., these bodies would not be diaphanous. So that it must pervade all bodies. Even opake substances must contain it, since, as in the case of gold, these become transparent when excessively thin.

Existence of an Ether.—We have no independent evidence to adduce of the existence of this medium. It is, therefore, an assumption; but one which is sanctioned by the high authority of Descartes, Huyghens, Euler, Hooke, Newton, Young, Fresnel, and some of the most distinguished philosophers of the present day, among whom are Sir John Herschel and Arago. These eminent men have seen in this assumption nothing inconsistent with their knowledge of the constitution of the universe. The electrician and the magnetician have assumed, respectively, an electric and a magnetic fluid, and there can be no impropriety, therefore, in the optician assuming a luminiferous ether, provided, however, that it be compatible with well ascertained facts, and do not violate known laws. Moreover, it is by no means improbable that the fluids which have been respectively assumed as the causes of electrical, magnetical, calorific, and luminous phenomena, may be one and the same.

Even gravity, perhaps, may be referable to the same cause. Newton* himself has thrown out a speculation of this kind. Alluding to the ether, he says, "Is not this medium much rarer within the dense bodies of the sun, stars, planets, and comets, than in the empty celestial spaces between them? And in passing from them to great distances, doth it not grow denser and denser perpetually, and thereby cause the gravity of those great bodies towards one another, and of their parts towards the bodies; every body endeavouring to go from the denser parts of the medium towards the rarer?" Very recently, Dr. Roget† and Mosotti‡ have shown how, on the assumption of an etherial medium, the phenomena of gravitation and electricity, may be included in the same law.

It has been said, that if the universe contained a fluid of the kind here referred to, the planets must experience some resistance to their motions, and therefore, that as no resistance can be detected, there can be no etherial medium. This conclusion,

* *Opticks*, p. 325. Query 21.

† *Electricity*. Published in the *Library of Useful Knowledge*.

‡ *On the Forces which regulate the Internal Constitution of Bodies*, in Taylor's *Scientific Memoirs*, part iii.

however, is by no means a necessary one, for "if this ether," says Newton*, "should be supposed 700,000 times more elastic than our air, and above 700,000 times more rare, its resistance would be above 600,000,000 times less than that of water. And so small a resistance would scarce make any sensible alteration in the motions of the planets in ten thousand years." The most satisfactory evidence of this resistance, if indeed it exist, might be expected to be found in the case of the comets, bodies made up of the lightest materials, in fact, masses of vapour, and therefore, from their less momentum, more likely to suffer retardation. In the case of Encke's comet, evidence of this resistance is believed to have been obtained. The mean duration of one entire revolution of this comet is about 1207 days, and the "magnitude of the resistance is such as to diminish the periodic time about $\frac{1}{10000}$ of the whole at each revolution; a quantity so large that there can be no mistake about its existence.†"

The following table of the mean duration of one entire revolution of this comet, allowance being made for perturbations occasioned by the action of neighbouring planets, is taken from a memoir by Encke‡.

	Days.
From 1786 to 1795.....	1208.112
" 1795 to 1805.....	1207.879
" 1805 to 1819.....	1207.424

Sir John Herschel § observes, that "on comparing the intervals between the successive perihelion passages of this comet, after allowing, in the most careful and exact manner, for all the disturbances due to the actions of the planets, a very singular fact has come to light, viz., that the periods are continually diminishing, or, in other words, the mean distance from the sun, or the major axis of the ellipse, dwindling by slow but regular degrees. This is evidently the effect which would be produced by a resistance experienced by the comet from a very rare etherial medium pervading the regions in which it moves, for such resistance, by diminishing its actual velocity, would diminish also its centrifugal force, and thus give the sun more power over it to draw it nearer. Accordingly (no other mode of accounting for the phenomenon in question appearing) this is the solution proposed by Encke, and generally received. It will, therefore, probably fall ultimately into the sun, should it not first be dissipated altogether, a thing no way improbable, when the lightness of its materials is considered, and which seems authorized by the observed fact of its having been less and less conspicuous at each reappearance."

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* *Opticks*, p. 327. Query 22.

† Airy, *Report on the Progress of Astronomy, in the Report of the British Association for* 1833.

‡ *Astronomische Nachrichten*, Nos. 210, 211.

§ *Treatise on Astronomy* (in *Lardner's Cyclopædia*), p. 309.

Leaving these speculations, and assuming, then, the existence of a luminiferous ether, I proceed to point out the properties such a fluid must be supposed to possess.

Etherial Molecules.—The ether consists, or is made up of minute parts, which we call *molecules*, between which there must exist attractive and repulsive forces *, in virtue of which the ether possesses extreme elasticity. Moreover, there appears to exist some attractive force between the etherial molecules and the particles of the grosser forms of matter. Indeed, Dr. Young supposed that the vibrating medium is the ether and ponderable matter conjointly.

But instead of insisting on the actual existence of an etherial medium composed of molecules, we "may be content to look at the theory simply as a mathematical system, which faithfully represents, at least, a wide range of phenomena, and to some extent connects the laws so made out with dynamical principles regulating the motions of a system of points, combined to form an elastic system, which, for *brevity* and *illustration*, *we call molecules*, constituting an *ætherial medium* †."

Etherial Waves.—If we suppose the existence of attractive and repulsive forces between the etherial molecules, it follows, that when these molecules are at rest or have attained a state of equilibrium, any attempt to move one molecule must be attended with the displacement of several; for the motion is extended to adjacent molecules. So that if a vibratory movement be communicated to one, it is extended to several. Now, an assemblage of vibrating molecules, in all phases of vibration, constitutes an *etherial wave*. These vibrations being communicated through successive portions of the etherial medium, reach the retina or expanded optic nerve, and are propagated along the optic nerve to the brain, where they excite in us the *sensation of light*, just as the vibrations of the air communicated to the auditory nerve, and from thence to the brain, produce the sensation of sound.

The number of impulses made by the etherial molecules on the retina in a given time, determines the *colour of the light*, just as the number of impulses by the aerial molecules on the auditory nerves determines the *pitch*, *note*, or *tone* of sound. Hence colours are to the eye what tones are to the ear.

"From Newton's measures of the thicknesses reflecting the different colours, the breadth and duration of their respective

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* See a paper by Mr. Earnshaw, *On the Nature of the Molecular Forces which regulate the Constitution of the Luminiferous Ether*, in the *Transactions of the Cambridge Philosophical Society*, vol. vii., part 1.

† *A General and Elementary View of the Undulatory Theory, as applied to the Dispersion of Light.* By the Rev. Baden Powell, 1841, pp. 4 and 5.

undulations may be very accurately determined. The whole visible spectrum appears to be comprised within the ratio of three to five, which is that of a major sixth in music; and the undulations of red, yellow, and blue, to be related in magnitude as the numbers 8, 7, and 6; so that the interval from red to blue is a fourth. The absolute frequency expressed in numbers is too great to be distinctly conceived, but it may be better imagined by a comparison with sound. If a chord sounding the tenor $\bar{c}$, could be continually bisected forty times, and should then vibrate, it would afford a yellow green light: this being denoted by $^{41}_{C}$, the extreme red would be $^{40}_{A}$, and the blue $^{41}_{D}$. The absolute length and frequency of each vibration is expressed in the table*;" supposing light to travel at the rate of 192,000 miles per second.

Colours.	Length of an Undulation in parts of an inch in Air.	Number of Undulations in an inch.	Number of Undulations in a second.
Extreme.....	.0000266	37640	458 millions of millions.
Red.....	.0000256	39180	477 "
Intermediate ...	.0000246	40720	495 "
Orange	.0000240	41610	506 "
Intermediate ...	.0000235	42510	517 "
Yellow	.0000227	44000	535 "
Intermediate ...	.0000219	45600	555 "
Green	.0000211	47460	577 "
Intermediate ...	.0000203	49320	600 "
Blue	.0000196	51110	622 "
Intermediate ...	.0000189	52910	644 "
Indigo	.0000185	54070	658 "
Intermediate ...	.0000181	55240	672 "
Violet	.0000174	57490	699 "
Extreme.....	.0000167	59750	727 "
Mean of all, or white	.0000225	44440	541 "

There is a *limit to the sensibility of both ear* and *eye;* that is, a certain number of impulses must be made in a given time on these organs before we become sensible of them; and if we go on augmenting the number, we cease to be sensible of them after a certain time. Now, the limits of sensibility of the eye are much more confined than those of the ear; or, in other words, the sensibility ceases much sooner in the case of the eye than in that of the ear.

* Dr. Young's *Course of Lectures on Natural Philosophy*, vol. ii. p. 627. The above table is also taken from this work. Dr. Young calculated the velocity of light at 500,000 million feet in $8\frac{1}{8}$ minutes; but I have adopted Sir John Herschel's assumption of 192,000 miles per second, which makes the number in the fourth column of the table different to those given by Young.

The following is the range of the human hearing according to Biot*:—

	Number of Vibrations in one second.	Length of Sonorous Waves.
		Feet in.
Commencement of appreciable Sounds.....	32	32 0
	64	16 0
	128	8 0
	256	4 0
	512	2 0
	1024	1 0
	2048	0 6
	4096	0 3
End of appreciable Sounds.....	8192	0 $1\frac{1}{3}$

But the actual range varies in different individuals, and we shall not be far from the truth if we assume, with Dr. Wollaston† and Sir John Herschel‡, that the whole range of human hearing includes about nine octaves.

Now on comparing the range of human hearing with that of vision, we find the relative limits of the two senses to be as follows:—

	Eye.	*Ear.*
Commencement of sensibility .	1	1
Cessation of ditto	$1\frac{58}{100}$	1024

It is highly probable, however, that the range of human vision, like that of hearing, is subject to variation in different individuals.

From these observations, then, it will be understood, that, according to the undulatory theory, the *colour* of the light depends on the lengths of the waves, or on their number in a given time. Thus *red* has the largest waves, and, therefore, the smallest number in a given time; while *violet* has the shortest waves, and, therefore, the greatest number in a given time.

The *intensity* of the light depends on the amplitude or extent of excursion of the etherial molecules from their points of rest; or in other words, on the height of the wave. Just as when we make a cord sound, we find that the sound diminishes in proportion to the diminution of the amplitude of the oscillations.

Vibrations.—The *vibrations* of the etherial molecules may be *rectilinear* or *curvilinear*. It is not easy to give a popular illustration of the first, which, however, may be easily conceived; but the motion of a pendulum is an excellent example of curvi-

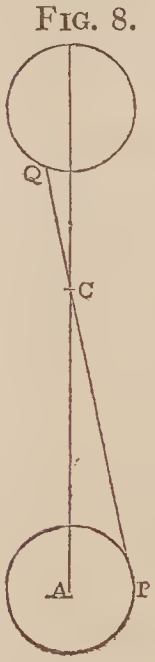
* *Précis Elémentaire de Physique*, vol. i. p. 324.
† *Phil. Trans.* 1820, p. 306.
‡ *Encyclopædia Metropolitana*, art. *Sound*, p. 792.

linear motion. A ball, suspended by a string, describes in vibrating a curved line, or, in other words, it vibrates in the arc of a circle.

An assemblage of molecules, vibrating *rectilinearly*, in the same plane, and in all phases of their vibrations, constitutes a *plane wave*. An assemblage of molecules, vibrating *curvilinearly* or *rotating*, the rotation or vibration of every molecule being made in parallel planes, constitutes what may be termed a *spiral* or *helicoidal wave*. If the molecule revolve in a circle, the wave is *circular;* if in an ellipse, the wave is *elliptical*.

All motion being naturally rectilinear, it follows, that when we see a body moving in a curve of any kind, we conclude that it must be under the influence of at least two forces; one putting it in motion, and another drawing it off from the rectilinear course, which it would otherwise have continued to move in. The cause of these curvilinear movements of the etherial molecules will be subsequently explained.

Fig. 8.



The Rev. Professor Baden Powell has contrived an ingenious machine, for showing in what manner rectilinear and curvilinear vibrations produce respectively plane and helicoidal (circular or elliptical) waves. It is founded upon this geometrical construction: a finite line, $P\ Q$, moves always through the point C, and with its end P always in the circumference of a given circle, whose centre is A; the end Q will describe a certain curve, which appears upon analysis to be one of a high order, but having *in general* some sort of oval form, which varies as the distance $A\ C$ is altered. If $A\ C$ be very great compared with the radius of the circle, Q will move up and down, *almost* in a straight line: if $A\ C$ be somewhat less, its path will *resemble* an ellipse; if still less, it will be more rounded or *resemble* a circle.

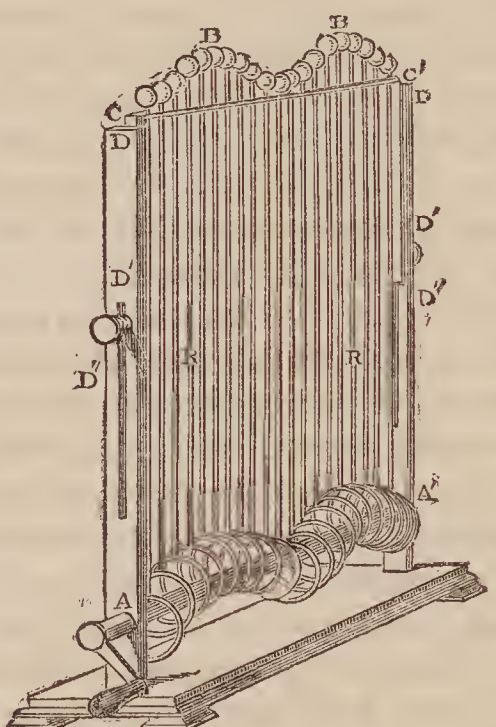
Upon this the machine is constructed as follows (A and C correspond in both diagrams):

The lower part consists of a stout iron wire bent into a series of cranks, of which the two extremes are in the same position, *e. g.* downwards; the middle one vertical, and the intermediate ones at intermediate inclinations. Attached to each crank by a hinge or joint, is a long rod, $R\ R'$, &c., which passes through an aperture in a cross-bar, $C\ C'$, at the top. The top of this rod is made conspicuous by an ivory ball or a ball painted white, B, the rest of the apparatus being painted black. The bar $C\ C'$ is attached to the supports $A\ C\ A'\ C'$, by screws, and can be removed (without changing the rods) from $D\ D$ to the positions $D'\ D'$, or $D''\ D''$. The proportions of the machine are not essential, but

only that the length of the rods should be great compared with that of the cranks. When the bar is at *D D*, on turning the handle a plane polarized wave is produced by the balls; when at *D' D'* an elliptical one; and when at *D'' D''* a circular one—that is, what, for illustration, and to the eye, may be considered so. If the distance *A D''* be eighteen inches, *A D'* should be about twenty-four, and *A D* about thirty-six inches; but these are not material as to exactness.

Mr. E. M. Clarke, philosophical instrument-maker, of the Strand, has constructed this instrument without cranks. The upright rods are attached inferiorly to metallic rings, through each of which runs an axis, *A A'*; and on this axis the rings are fixed in a spiral or helicoidal manner.

FIG. 9.



Professor Powell's Machine, as constructed by Mr. Clarke.

Transversal Vibrations.—I come now to a most important part of the undulatory hypothesis—that by which the phenomena of polarized, as distinguished from those of common or unpolarized, light are accounted for. I refer now *to the hypothesis of transversal vibrations*, first suggested, I believe, by Dr. Young, but most admirably developed and applied by Fresnel.

"The existence of an *alternating motion of some kind*, at minute intervals along a ray, is," says the Professor Powell,* "as real as the motion of translation by which light is propagated through space. Both must essentially be combined in any correct conception we form of light. That this alternating motion

* *A General and Elementary View of the Undulatory Theory*, p. 4.

must have reference to certain directions *transverse* to that of the ray is equally established as a consequence of phenomena—and these two principles must form the basis of any explanation which can be attempted."

In order to understand transversal vibrations, let us first consider how waves of water, and of other liquids, are formed. If a stone be thrown into a pond, there is formed a system or group of waves, which commences at the spot where the stone impinges, and gradually extends outwards in the form of concentric circles. The aqueous particles in the centre are forced down, and the surrounding ones thereby urged upwards above the normal level of the water. In this way the central depression, and the first or innermost circular heap, are formed. But gravity soon causes this heap to subside, and fill up the central depression, while by its downward progress it acquires momentum, and thereby descends below its normal level, thus not only giving rise to a circular depression, but causing the formation of another and outer circular heap by the elevation of the neighbouring particles. In this way the waves gradually extend outwards. It is obvious, then, that in *waves of liquids*, the directions of vibration of the molecules is *vertical*, or nearly so, while the propagation of the waves is *horizontal*.

In a vibrating cord, *the vibrations are rectangular to the propagation of the undulations* along the cord.

In *luminous waves*, the direction of vibration is supposed by Fresnel to be *transverse* to the direction of propagation; and the more recent researches of Cauchy seem to have established the doctrine of transversal vibrations; but he assumes a third vibration, namely, one *parallel* to the ray, so that, according to him, the motions of the molecules take place in *three rectangular axes*. The necessity for this third axis of vibration, parallel to the ray, seems to be derived from the phenomena of dispersion.

Now, *polarized light*, on the wave hypothesis, is light which has only one plane of vibration; whereas *common* or *unpolarized light* consists of light having two or more planes of vibrations, of which two must be rectangular—that is, after the molecules have vibrated in one plane, they change their vibration to another plane. So that common light consists in a rapid succession of waves in which the vibrations take place in different planes. It does not, however, appear that the planes of vibration are *continually* changing; but that in each system of waves, there are probably several hundred successive vibrations, which are all performed in the same plane; although the vibrations of one system bear no relation to those of another. Thus, then, we call that light *polarized*, in which all the vibrations take place in *one* plane; but when vibrations are succeeded rapidly

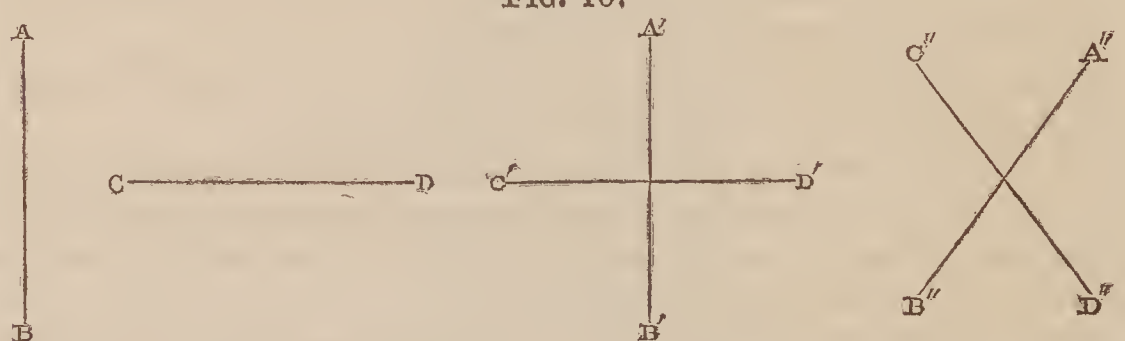
by other vibrations in an opposite plane, the two waves though *separately* called *polarized*, are *together*, termed *unpolarized* or *common* light; so that, as Fresnel has observed, *common* light is merely *polarized light, having two planes of polarization at right angles to each other.*

Thus, then, I have now replied theoretically, as well as practically, to the question, "*What is polarized light?*"

Partially polarized light consists, according to Sir John Herschel, of two unequally intense portions; one completely polarized, the other not at all. Sir David Brewster, however, regards it as light whose planes of polarization are inclined at angles less than 90°. But to the latter view some objections have been raised by Mr. Lloyd.

In the following diagram, let the straight lines represent the directions in which the etherial molecules are supposed to vibrate. Then $A\ B$ and $C\ D$ will represent the direction of vibration of two oppositely polarized rays; $A'\ B'\ C'\ D'$ the two rectangular directions of vibration of a ray of common or unpolarized light; and $A''\ B''\ C''\ D''$ a ray of partially polarized light, according to Sir D. Brewster's hypothesis.

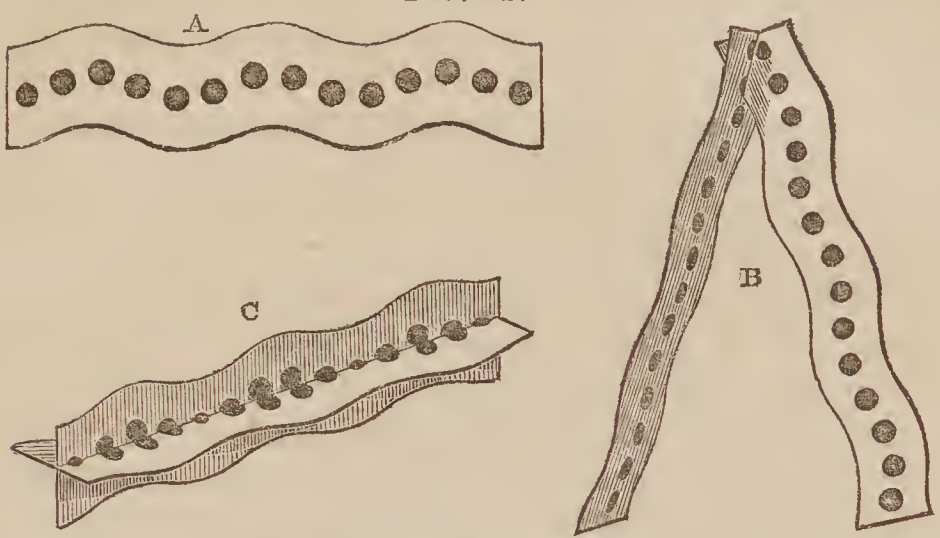
FIG. 10.



"The difference between a polarized and an ordinary ray of light," says Sir John Herschel, "can hardly be more readily conceived than by assimilating the latter to a cylindrical, and the former to a four-sided prismatic rod, such as a lath or a ruler, or other long, flat, straight stick."

In order to illustrate Fresnel's notion of transversal vibrations, and of the hypothetical difference between common and polarized light, *painted card models* are very convenient. A piece of card-board is cut out in a waved or undulated form, so that the curves of the upper and lower edges accord. Then, midway between these edges, a row of circular black spots is painted on the card: these are to represent the etherial molecules, while the card-board represents the plane of vibration. A single card thus cut and painted serves to illustrate a ray of plane-polarized light (Fig. *A*): two of them placed side by side, with their planes at right angles to each other, *B*, represent the two oppositely-polarized rays produced by a double refracting prism, while two so placed that they mutually cross, represent common light, *C*.

Fig. 11.



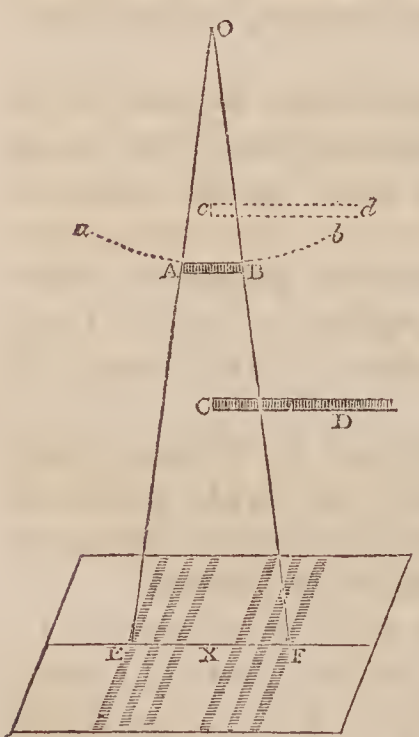
We are now prepared to understand how common light becomes polarized. In the case of the *doubly refracting bodies* the two planes separate, for reasons that will be explained in the next lecture; and as the two waves have the planes of their vibrations at right angles to each other, we see now how the rays are said to be oppositely polarized. As these two waves are propagated with different velocities, they in consequence follow different paths. The *tourmaline* likewise separates the two planes; but it gradually extinguishes the one, by offering such an impediment to its progress that its vibrations are destroyed. The agency of the *reflecting plate* in polarizing light may also be readily accounted for. When a ray of common light falls on a transparent surface, at a certain angle, its planes of vibration are resolved into two, one of which is transmitted, the other reflected; both are polarized, but oppositely.

The action of the *analyzer* or *test* may also be easily understood. Suppose the analyzer to be a *reflecting plate:* if this plate be at the same angle to the ray as the polarizing plate, the vibrations will be reflected when the planes of reflexion of the polarizing and analyzing plates coincide—but will be transmitted (that is not reflected) when the planes are at right angles to each other. Suppose the analyzer to be a *tourmaline* plate: in one position this plate permits the vibrations to be transmitted, but in a position perpendicular to this it destroys them. So that in these two rectangular directions, the crystal of tourmaline must possess unequal elasticities; for the motion or vibration is transmitted in the one, but stifled or destroyed in the other direction. Suppose the analyzer to be a *rhombohedron of Iceland spar;* in either of two rectangular directions the vibrations of the polarized incident ray are propagated unchanged, but at an angle of 45° to either of these positions, the plane of vibration of the incident ray is resolved into two rectangular planes, each of which forms an angle of 45° with the incident ray.

Interferences of Light.—It is a law in dynamics, that the velocity produced by two joint forces, when they act in the same direction, will be as the sum of the forces. Hence if two waves, all of whose parts respectively coincide, meet, it is evident that their velocities will be doubled. Whether the vibrating medium be water, air (*sound*), or ether (*light*), this statement holds good: the intensity of the waves is doubled.

But the velocity of two joint forces, when they act in opposite directions, will be as their differences. Hence, if a wave (of water, air, or ether) be half an undulation behind another wave, the velocities of the two are mutually destroyed. When stones are thrown into a pond, and two groups of waves cross each other on its surface, there are points at which the water remains immoveable when the two systems are nearly of the same magnitude, while there are other places in which the force of the water is augmented by their concurrence. If two sonorous undulations differ a little from each other in frequency, they alternately tend to destroy each other, and to acquire a double, or, perhaps, a quadruple force; and the sound gradually increases and diminishes in continued succession at equal intervals. This alternate intension and remission is called *a beat.*

Fig. 12.



In the same way, the waves of the luminiferous ether interfere, and, mutually destroying each other, cause darkness. This important fact, that under some circumstances, light added to light causes darkness—a fact apparently fatal to the projectile theory of light—was first established by Dr. Young. This distinguished philosopher—whose attainments and knowledge were insufficiently estimated while he was living—passed a sunbeam through a hole (O) made with a fine needle in thick paper, and brought into the diverging beam a slip of card (A B) one-thirtieth of an inch in breadth, and observed its shadow (E F) on a white screen, at different distances. The shadow was divided by parallel bands, but the *central line* (X) *was always white.* That these bands originated in the interference of the light passing on both sides of the card, Dr. Young demonstrated by simply intercepting the light on one side by a screen (C D), leaving the rays on the other side to pass freely. In this arrangement all the fringes which had before existed in the shadow immediately disappeared, although the light inflected on the edge

(A) was allowed to retain its course. The same result took place when the intercepting body was at *C D*, before the edge *B* of the body.

By a series of wooden sliders, originally contrived by Young, but put into a very convenient form for use in the lecture-room, by my friend Mr. Woodward, the interference of waves may be neatly illustrated. By this apparatus it will be seen that when the difference amounts to 2, 4, 6, or other even number of half undulations, the waves coincide and mutually augment their intensities; while, when the difference amounts to 1, 3, 5, or other odd number of half undulations, there is discordance and mutual destruction. Now it will be perceived, that these numbers coincide with those referred to by Newton, as expressive of his fits of transmission and reflection.

If two waves of *homogeneous* or *monochromatic light* interfere, the result will be *an augmentation* or *diminution* of *brilliancy*, or *complete destruction*. The light is *augmented* when the waves accord—but is *lessened* or *destroyed* when they are mutually opposed. Hence Newton's rings, seen by homogeneous light, are merely dark and light bands of one and the same colour.

But if two waves of *heterogeneous* or *white light* interfere, the result will be *the production of vivid coloured fringes*. Certain colours are destroyed, while others remain, or have their brilliancy augmented.

It is a law in dynamics, that a body acted upon by two forces united, will describe the diagonal of a parallelogram in the same time in which it would have described its sides by the separate action of those forces*. Hence, if two waves, whose molecules are in the same phases of vibration, but whose planes of vibration are more or less angular, say rectangular, to each other, the only effect produced is an alteration of the plane of vibration.

This is an explanation of a fact discovered by Fresnel, and laid down by him as a law, that "two rays of light, polarized at right angles to each other, exhibit none of the phenomena of interference," that is, they produce no colours or fringes.

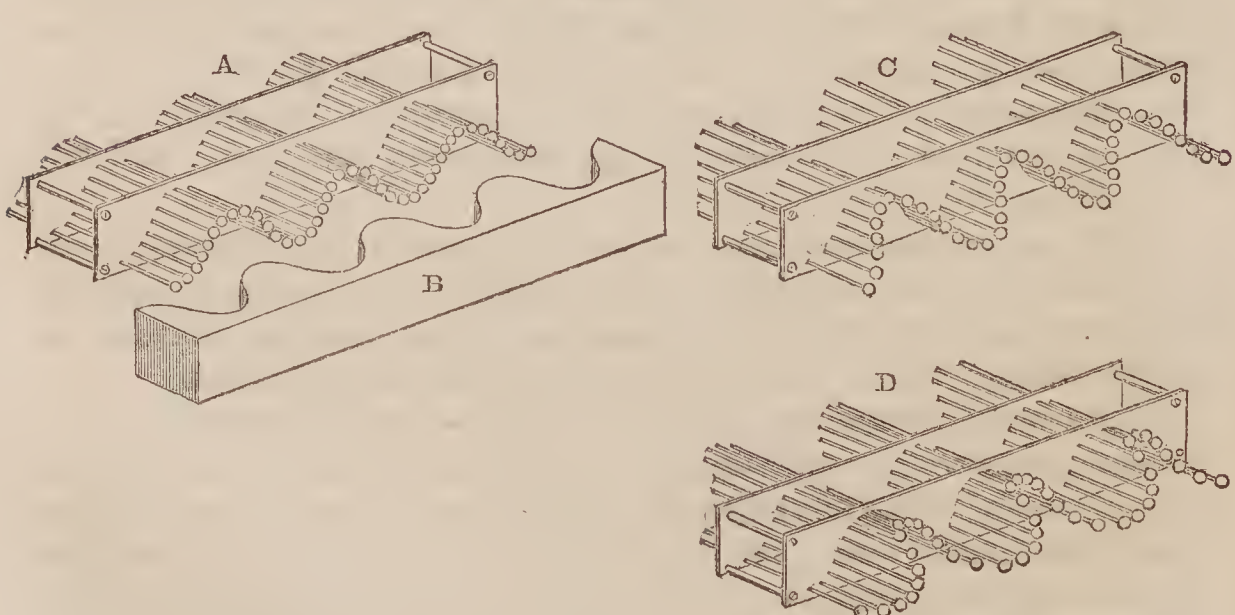
If both the forces act upon a body in such a manner as to move it uniformly, the diagonal described will be a straight line; but if one of the forces acts so as to make the body move faster and faster, then the line described will be a curve. Now this dynamical law explains how two *plane* luminous waves, whose molecules are vibrating in rectangular planes, by their mutual action, produce a *circular* or *elliptical* wave. For if two

* This fact was demonstrated by a neat machine, invented by Mr. E. M. Clarke, of the Strand.

systems of waves of equal intensity, and polarized in rectangular planes, differ in their progress $\frac{1}{4}$ of an undulation, the compound movement which they will communicate to each molecule, instead of being *rectilinear*, as in the two fasciculi considered separately, will be *circular*, and will be performed with uniform velocity. But if the difference of progress, instead of being an even or an uneven number of $\frac{1}{4}$th of undulations, be a fractional number, the vibratory movements will be neither rectilinear, nor circular, but *elliptical.*

Here is an apparatus (Fig. 13), contrived, I am informed, by Professor Wheatstone, which illustrates how two rectangularly polarized rays of light may influence each other. It consists of a series of rods disposed horizontally in an undulated form, so as to represent a system of plane waves. One end of each rod is rendered conspicuous by a white ball, and it will be seen, that, as now arranged, all the balls (which represent a line of etherial molecules) are in one plane, *A*. If now a block of wood, *B*, cut so as to represent a system of plane waves of equal size to those represented by the rods, be pressed against the balls, so that the two systems of waves act on each other in a rectangular direction, then, when the waves coincide, the plane, in which the balls lie, changes, and becomes diagonal, as in *C*; whereas, if the block be so applied to the balls, that the two systems of waves do not coincide, then the balls no longer remain in one plane, but become placed in a helicoidal manner, representing a circular or elliptical wave, as in *D*.

FIG. 13.



With these remarks I finish the theory of light, and have now arrived at the subject of *Coloured Polarization.*

PHARMACEUTICAL MEETING,

APRIL 12th, 1843.

MR. PAYNE, VICE-PRESIDENT, IN THE CHAIR.

RESEARCHES ON PYROLIGNEOUS ACID,

WOOD-NAPHTHA, ALCOHOL, AND CERTAIN OF THEIR COMPOUNDS,

INSTITUTED WITH THE VIEW OF ASCERTAINING THE PRESENCE OF ALCOHOL WHEN FRAUDULENTLY DISGUISED WITH THESE TWO FLUIDS.

BY ANDREW URE, M.D., F.R.S.,
Honorary Member of the Pharmaceutical Society.

On the 22d of November last, a wine-bottle full of a light brown liquid, imported into Liverpool under the name of Naphtha, was sent to me for examination. It smelled rankly of pyroligneous acid, had an unpleasant sourish taste, reddened blue litmus paper strongly, and had a specific gravity of 0.942=19.5 per cent. under excise proof. The acid being neutralized with a test solution of pure carbonate of potash, indicated 1.2 per cent. of real acetic acid—equivalent to 24 per cent. of excise proof vinegar.

Another portion of the liquor was neutralized with quicklime, and distilled by the heat of a water-bath, when it afforded a spirituous fluid, of specific gravity 0.878, equivalent in quantity to about 80 per cent. of a spirit excise proof. This being again rectified with excess of lime, lost much of its empyreumatic flavour, and showed itself to be alcohol tainted with the pyrogenous oil of wood vinegar, and not to be wood-naphtha.

When two liquids are equally volatile, as is the case with alcohol and naphtha, or wood-spirit, it is utterly impossible to separate them completely by distillation, or by any direct methods, and this fact is no doubt well known to the compounder of this spurious naphtha. In like manner, when lead and tin are combined, as in solder, it is impossible to separate them by fusion, because they melt together; but they may however be most easily parted by the action of nitric acid, which converts the tin into an insoluble oxide, and the lead into a soluble salt, and then the two metals may be perfectly separated by mere washing with water, and the quantity of each exactly ascertained, from the known composition of tin oxide and nitrate of lead.

Thus, also, when alcohol and naphtha are mixed, we must have recourse to an indirect but a quite accurate method of parting them, and estimating the proportion of each in the mixture. In the present case, however, that is hardly necessary, since, on rectifying the spurious naphtha by distillation with

quicklime, I could distinguish plainly, by the taste and smell, the presence of alcohol in very large proportion in the purified spirit.

1. When alcohol of from fifty to sixty per cent. over-proof is mixed with its own weight of sulphuric acid, and properly distilled, it affords the fragrant liquid well known by the name of ether or sulphuric ether, and when the distillation is continued too long, the residuum in the retort becomes black, thick, and finally froths up with such impetuosity, as to be projected out of the vessel, though this be of fifty times the capacity required by the liquid before its intumescence. The process must, therefore, be well watched, and the heat withdrawn, some time before this phenomenon occurs.

100 parts of absolutely pure alcohol yield 80.6 parts of ether, by losing merely 19.4 parts of the water combined in the elements of alcohol. See *Liebig's Organic Chemistry*, i., p. 315.

2. When wood-spirit (wood-naphtha) of the same strength is treated in like manner, and distilled along with sulphuric acid, it affords not a LIQUID, but an AERIFORM product. "Methylic ether," says Professor Liebig, "is prepared by distilling a mixture of equal volumes of concentrated sulphuric acid and wood-spirit. The *gas* which is disengaged, is to be passed first through milk of lime, and then through several tubulated bottles filled with water. This compound is a colourless gas, possessed of an agreeable ethereous odour. A cold of 16° below zero, of the centigrade scale (29° Fahr., below the freezing point of water) does not render it liquid."—*Chimie Organique*, vol. i., p. 540.

Berzelius says, "Oxide of methyle or lignous ether (made as above described) is a *gas* which does not condense in the receiver, but which should be collected over mercury. It is a colourless gas, which does not condense at 16° under 0° cent. As the operation of distilling the mixture of wood-spirit and sulphuric acid advances, the mixture becomes yellow, brown, and at last black, but *without thickening or frothing up, as happens when alcohol is treated in the same manner.*"—*Traité de Chimie*, vol. iii., p. 403, of the French translation by Valerius, Brussels, 1841.

"Pyroxylic spirit," says Professor Kane, in his 'Elements of Chemistry,' published about a year and a half ago, "is frequently termed methylic alcohol. The methylic ether is, at ordinary temperatures and pressures, a colourless gas."—P. 1091.

3. I rectified the said naphtha by repeated distillations; first, by itself to separate the pyroligneous acid (which was obtained in very measurable quantity), and then with quicklime. The volatile spirit thus procured had a specific gravity of 0.839, and resembled alcohol more than naphtha. I then treated it, as above prescribed, with sulphuric acid, when it yielded a fine fragrant LIQUID sulphuric ether, and nearly in as large a quantity as the same volume of alcohol could have done. A very little lignous or methylic ethereous

gas also appeared, and passed off through the water of the safety-tube of the receiver. Three fluid ounces nearly of ether were obtained. On continuing the heat, after the receiver was removed, the materials in the retort on the sand-bath became thick, black, frothed up, and were projected out of the vessel with great force. Thus, by the product of fine liquid ether, and the intumescence in the retort, two infallible proofs of abundance of alcohol in the said naphtha are obtained.

It is my opinion that the contraband article in question will make as good ether as the best spirits of wine, because the minute wood-spirit or pyroligneous portion flies off in the form of a gas during the etherification. Hence its clandestine importation would prove a serious detriment to the spirit revenue, as well as to the honest distiller, rectifier, and manufacturing chemist.

I have analyzed the pyroligneous acid residuum of the first distillation of the said naphtha, conducted by the heat of a water-bath, and I find that four fluid ounces of it saturate with lively effervescence as much carbonate of potash as two fluid ounces of ordinary vinegar, of five per cent. of real acetic acid, could have done.

On the 25th of February, I received a box containing eighteen bottles full of the said naphtha, having the corks sealed with the custom-house arms.

On Monday, the 27th, I opened the chest and uncorked the bottles in the presence of Mr. Scanlan, well known to the chemical world, as being the author of the only discovery of consequence made regarding naphtha by any British chemist. He has had, moreover, much experience in the manufacture of ether, and in the rectification of alcohol and wood-naphtha upon the commercial scale.

On Monday morning, we commenced our analytical operations. We found all the sample bottles to contain a liquor, apparently the same, having a specific gravity of 0.944 in general — one was 0.942, and three or four were 0.948. This trifling difference arose from slight variations in the quantity of pyroligneous acid which had been added originally to the alcohol for the purpose of disguising it. They all had the sour smell of crude vinegar, and reddened blue litmus paper very strongly.

We subjected half a gallon measure, taken from five of the bottles indiscriminately to distillation by the heat of a water-bath, as a preliminary experiment, and obtained a spirit of specific gravity 0.901, or 14.67 over-proof, while an acidulous residuum was found in the still, which was saturated with effervescence by crystals of soda, and indicated one per cent. of real acetic acid in the original liquor, equivalent to twenty per cent. of excise proof vinegar. The above experiment furnished

eighty-one per cent. of proof spirit out of the gallon. Some of this spirit was rectified along with quicklime in a glass retort, by the heat of a water-bath, whereby its specific gravity became 0.832, or 58.63 over-proof.

A portion of this spirit was mixed with its own weight of sulphuric acid (oil of vitriol), and distilled with proper precautions by the heat of a sand-bath, when there was obtained an agreeable smelling ether, in about the same quantity as pure alcohol, of the same strength, would have yielded. This fluid, on being rectified in the usual way, afforded a fine ether, of specific gravity 0.752 ; a lightness perfectly decisive of the perfection of the ether, and consequently of the spirit from which it was formed, being nothing else than alcohol.

Having made these incipient trials, we proceeded to operate on a larger scale, and distilled a gallon of the Liverpool liquor in a still mounted with a rectifying apparatus of my own invention. The pyroligneous acid was saturated beforehand with quicklime, and then the clear filtered liquor was subjected to distillation over a naked fire. The spirit which came over was again rectified with more quicklime, in a glass apparatus, by the heat of a water-bath, when it came over of a specific gravity 0.8268, or 61 over-proof. Spirit of this gravity being well adapted to making ether, a proper proportion of it was taken along with sulphuric acid, and submitted to the process of etherification in Bouillay's continuous method, as described in my Dictionary of Arts, p. 442. Ether came over most abundantly through Liebig's glass condenser, into a glass receiver, furnished with a safety-valve. The ether was characterized by its peculiar striæ or lines of fluid down the sides of the globular receiver, as also by its cool refreshing fragrance. No less than twenty-six fluid-ounces, apothecaries' measure, were obtained of an ethereous liquid, of specific gravity 0.787, which, on rectification, became of specific gravity 0.742, boiled under 100° (Fahr.), and amounted to fully twenty ounces measure, being a quantity about as great as the same quantity of alcohol of the purest kind would have yielded. This ether is lighter than the best standard ether of the Pharmacopœia, sold at the Apothecaries' Hall, London, therefore finer, and certainly as fragrant, and more volatile.

The sequel of the ether distillation furnished the usual liquid products of the etherification of alcohol along with olefiant gas in great profusion, characterized by its burning with a white flame, like that of wax candles, and by its being condensed on admixture with chlorine gas into chloride of carbon, the oily looking liquid from which it derives its familiar name.

I have found that when ten parts of wood-naphtha are mixed with ninety parts of alcohol, each of moderate strength, and the

mixture is treated with sulphuric acid as above, it does not afford any good genuine ether, but a peculiarly pungent offensive fluid, proving that the spirit drawn out of the Liverpool naphtha must contain little or no real wood-naphtha, but that it owes its peculiar taste and flavour to the pyrogenous oil of the wood vinegar, of which a few drops suffice to contaminate a gallon of good sweet alcohol.

Sweet spirit of nitre is another product of alcohol, consumed in vast quantities in the United Kingdom, and which cannot be formed at all with wood-spirit naphtha. Mr. Scanlan and I followed the prescription of the Pharmacopœia, and obtained the full quantity of sweet spirit of nitre from the rectified Liverpool liquor, just as if we had used a like proportion of alcohol. The sp. gr. of this spirit was only 0.842=53.7 per cent. over-proof, while that of the commercial article is 0.850=49.1 over-proof.

We have also prepared a good drinkable gin, which persons accustomed to that beverage have relished very much. It was made with the Liverpool naphtha rectified with potash, as is customary in the compounding of cordials.

Having thus proved the alcoholic nature of the article, we next made a careful experiment to determine its exact amount, and that of the pyroligneous acid with which it was disguised. We distilled a gallon of the Liverpool liquor previously neutralized with lime, and obtained at one operation, by means of my rectifier, a spirit 37.46 per cent. over-proof, equivalent in quantity to eight-tenths of the whole gallon in proof-spirit, or 80 per cent. The residuary liquid, pyrolignite of lime, was decomposed into acetate of soda by crystals of soda, of which 3000 grains were required, indicating 1083 grains of real acetic acid, equivalent to about 45oz. measure of vinegar, excise proof, or thirty per cent. of the original liquor. Thus the Liverpool pretended naphtha consists of seventy parts alcohol, 14.3 over-proof, and thirty of pyroligneous acid.

I now proceed to describe the researches we made into the properties of the several kinds of wood-naphtha now in the market, with the view of ascertaining the best criteria for distinguishing that fluid from alcohol, and consequently for discovering directly whether any sample of naphtha be illicitly compounded with alcohol, or be genuine.

With this view, I procured from Messrs. Hill of Deptford, whose chemical works I am well acquainted with, a quantity of their rectified wood-naphtha, and also of the rough naphtha as first drawn off by distillation from the pyroligneous acid of their own manufacture.

We rectified in my still a gallon of their genuine rough naphtha, and found it to exhibit all the phenomena characteristic of

this fluid; viz.,boiling at a temperature fully twenty degrees below that at which alcohol-wash of the same gravity boils, and exhaling the peculiar smelling vapour of aldehyde, most offensive to the nose, and causing the eyes to redden and to weep. When thus distilled, it agreed in its properties with their rectified wood-naphtha. The fluid is colourless, has a peculiar, somewhat offensive odour, exhales, at a moderate warmth, a vapour very painful to the eyes, and, therefore, much dreaded by the hatters, who used to employ it in large quantities for dissolving their so-called gums, or shellac and sandarac. Hence there is a very strong temptation to introduce in its stead smuggled alcohol, slightly disguised, which does not injure the eyes, and is, moreover, a far better solvent of the gums. The pyroxylic spirit of Messrs. Hill is almost the only one that I have been able to meet with on sale in this country, which I think to be truly genuine. Other samples consist, more or less, of alcohol, illicitly introduced to the great injury of the revenue.

Genuine wood-spirit has the following distinctive characters: 1. When rectified naphtha, of specific gravity of 0.870, such as Messrs. Hill send out for sale, is distilled along with a large quantity of unslaked powdered quicklime, in a retort plunged into boiling water, the spirit comes over with its gravity unchanged; whereas, if genuine alcohol, or the spirit from the Liverpool naphtha, be distilled in the same way, each of these is alike concentrated, so as to be obtained nearly free from water, and of a gravity under 0.800, or 70 per cent. over-proof, and of the temperature 60° (Fahr.). Here, then, is a most remarkable difference between alcohol and wood-spirit; one which of itself demonstrates the Liverpool liquor to be alcohol, and not naphtha; for did it contain even five per cent. of naphtha at the original dilution of the liquor, it could not be concentrated by the heat of boiling water with quicklime to the above low gravity. Wood-spirit, thus, seems to possess a greater affinity for water than alcohol—a fact, of which another evidence will be presently adduced.

2. When alcohol is reduced with water, the mixture undergoes a condensation of volume, so that 100 gallons of strong alcohol, mixed with 50 gallons of water, do not occupy the space of 150 gallons, but a less space, proportional in a certain degree to the strength of the alcohol. Upon this fact, the excise tables of alcohol are constructed. Thus when alcohol, of specific gravity of 0.832, or 58.6 over-proof, is to be reduced to proof, or 0.920, 100 parts of it in volume are to be diluted with water till the mixture at 62° Fahr. occupies the space of 158.6 measures.

The spirit from the Liverpool liquor agrees exactly with alcohol in this respect, but both differ from wood-naphtha, which suffers a greater penetration of parts, and condensation of volume

by dilution with water, so that 100 parts of specific gravity 0.832, made to occupy 158.6 measures, by the addition of water, form a mixture of specific gravity 0.927 or 0.928, at 62° Fahr. Even the genuine naphtha of specific gravity 0.870 or 36.12 over-proof, reduced with water till 100 measures become 136.12, has a specific gravity of 0.927; whereas alcohol and the Liverpool spirit so treated, have the specific gravity of 0.920, or excise spirit proof.

3. The boiling temperatures of alcohol and genuine wood-spirit are remarkably different, and afford therefore excellent criteria for distinguishing the two fluids. Hills' naphtha of 0.870 specific gravity, boils at 144° Fahr. when heated in a small flask or matrass by means of a water-bath. If it be concentrated to the strength corresponding to specific gravity 0.832, it boils at 140° Fahr. Alcohol of specific gravity 0.870, boils in the same circumstances at 180°, and of specific gravity 0.832, at 171°. 5′ Fahr. The spirit from the Liverpool liquor agrees with alcohol in its boiling points at the several degrees of specific gravity, but differs entirely from naphtha in this most characteristic feature. If 10 per cent. of naphtha be mixed with alcohol, each of specific gravity 0.870, the boiling point of the alcohol is lowered at least six degrees of Fahrenheit's scale. Upon this physical principle, it is clearly demonstrable that the spirit in the Liverpool liquor does not contain five per cent. of wood-naphtha.

The spurious naphthas in the market are characterized by two features: first, their low specific gravity; second, their high boiling points. Some of them have a gravity of only 0.822, others of 0.827. Now, as it is impossible to concentrate real wood-spirit to this pitch, by any ordinary manufacturing means, while alcohol may be without much difficulty so concentrated, a suspicion naturally arises of the illicit introduction of alcohol into a liquid sold at a price 60 per cent. at least under that of alcohol. This suspicion becomes a certainty on referring to the boiling points and other means that have occurred to me. The temperature at which these very *light* naphthas boil, is *higher* by at least 8° Fahr. than that of the much heavier and more watery naphtha of Messrs. Hill. One naphtha of specific gravity of 0.8216 boils at 152°, while Hill's genuine wood-spirit of 0.832 boils at 140° Fahr. By compounding alcohol and genuine naphtha, fluids are formed with boiling points like the above spurious or fraudulent naphthas.

4. When genuine naphtha is treated with its own *weight* of sulphuric acid, as in the process of etherification, the phenomena and products are quite different from those with alcohol and sulphuric acid. White fumes are exhaled most abundantly, while a gas is disengaged that burns with a faint blue flame. An acidulous

liquor is found in the receiver, which being neutralized with potash, and redistilled, affords a liquid of specific gravity 0.911, possessed of a peculiar pungent spicy odour, and resembling coal-oil in being immiscible with water. Here are sufficient proofs that real wood-spirit can furnish with sulphuric acid nothing in any respect resembling ether.

In the course of the above and other elaborate researches, unnecessary to be detailed here, I had the good fortune to contrive a mode of solving the following rather puzzling problem — one of great consequence in this fiscal question :

Given a mixture of wood-naphtha and alcohol, each of the same specific gravity or otherwise, and which suffer no change of density by admixture : to determine in the course of twenty minutes the proportion of each.

The solution of this problem is quite independent of the boiling temperature, which is, indeed, not precise enough to lead to correct results in the present case. It is, in fact, performed without the aid of heat.

Having terminated for the present the chemical proofs, I shall subjoin some commercial considerations upon the subject. Wood-naphtha is the product of pyroligneous acid solely, from which it is obtainable in the very small proportion of less than one per cent. But that acid is made almost solely for the use of calico-printers, so that where there are no great calico-printing establishments, as there are none in the United States, little or no wood vinegar is prepared. Now the cargo of the present naphtha detained at Liverpool, amounting to about 2000 gallons, would be equivalent to at least 200,000 gallons of pyroligneous acid, a quantity certainly far greater than has been formed there since the days of Elizabeth. Great Britain and France supply the American females with a profusion of printed goods of such price, beauty, and fashion, as to suppress almost entirely their small homely fabrics of the kind. If they cannot, therefore, send us naphtha, which they do not make, and could not make so cheaply as in the works of Swansea and other parts of Wales, they can inundate England with their coarse ardent spirits in the depressed state of their distilleries, at the rate of one shilling per gallon, whereas, naphtha is worth six times that sum; and they can readily procure as much pyroligneous acid as will suffice to give their alcohol such a taste and flavour as to deceive chemists who take their nose for their guide. This is ‘ the heart of the mystery.’

Dr. Ure, after the conclusion of his paper, exhibited the apparatus and explained the process for the preparation of ether, according to Boullay’s continuous process.

The Chairman expressed the thanks of the Society to Dr. Ure

for his paper, and was glad that it had come forward at that time, as it afforded a demonstration of the disposition which prevails in the Society to protect the revenue of the country, notwithstanding the persecution the members have lately suffered for selling spirit in small quantities. He took occasion to caution the members of the Society against purchasing any spirit or naphtha, if offered below the market-price, which circumstance alone would be sufficient to excite suspicion. It would be foreign to the business of the meeting to discuss the sale of spirits of wine, but he might be allowed to recommend the members to be particularly careful not to sell it under any circumstances, except for medicinal purposes.

ON CAFFEINE, THEINE, THEOBROMINE, &c.
THEIR CHEMICAL CHARACTERS, AND PROBABLE PHYSIOLOGICAL ACTION.

BY ALFRED BARING GARROD, ESQ., M.B.
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WITHIN the last few years, peculiar azotized substances, neutral in most of their properties, and having a remarkable composition, have been found in coffee, tea, the cocoa plant, and in some other vegetable bodies. The discovery of these did not excite much interest at the time, and their action on the body was supposed to be little or nothing, as they do not give to the alimentary substances, from which they are derived, their peculiar properties; but very recently, since the publication of the Animal Chemistry and Physiology by Professor Liebig, they have acquired great interest, for he has endeavoured to show, that probably man, in a state of civilization, may require such substances to assist in the formation of a secretion most important to animal life—the bile.

I shall, therefore, this evening, give you an account of these substances, including their mode of preparation, and their chemical and physical properties, and then endeavour to illustrate, by comparing their composition with that of the bile, how they may prove of use in the animal economy.

1. *Caffeine.*—This substance was discovered by Runge in 1820. Coffee contains, besides this peculiar body, many other soluble substances, as sugar, a peculiar acid called the tannin of coffee, another acid named the caffeic or caffic acid, also colouring and extractive matters, and a little volatile oil. To obtain caffeine, several methods have been employed; perhaps, the best is to precipitate the tannin and caffeic acid by means of the subacetate of lead, from a strong decoction of raw coffee, then to digest it on freshly precipitated oxide of lead, which neutralizes any acetic acid which is set free, and causes a still further precipitate after

the subacetate has ceased to do so. Any lead remaining is to be thrown down by passing sulphuretted hydrogen through the solution, and the filtered fluid by evaporation gives beautiful crystals of caffeine, which, if coloured, can be obtained quite pure by a second crystallization and the use of a little animal charcoal.

Another mode of preparation is that of Robiquet, who precipitates the decoction of coffee by means of an infusion of nut-galls, dissolving the precipitate in alcohol, then mixing the solution with magnesia, which combines and forms an insoluble compound with the tannic acid, and leaves the caffeine in solution, from which it is obtained by evaporation. The first of these methods is preferable in this country, because it does not require the use of alcohol.

Caffeine was at first considered to be a vegetable alkali, but it is found to possess neither basic nor acid properties, its solution does not affect either red or blue litmus paper; it is not very soluble in cold water; one part of caffeine requires fifty parts of water to dissolve it, neither is it very soluble in cold alcohol, but hot water dissolves it very readily, from which it crystallizes during the cooling; acids do not alter it, but cause it to dissolve more easily than water. Its solution has a slight bitter taste. It is not precipitated by the salts of iron, copper or lead, but is precipitated by tannin.

Caffeine crystallizes in two forms, from a strong and acid solution in snow white delicate flexible needles, having a silky lustre, not unlike asbestos, but from a weak and slightly ammoniacal solution, it crystallizes in long transparent prisms, not very flexible. When heated above 212° Fahr. it loses about eight per cent. of water, and becomes opaque; at 352° Fahr. it fuses, and at a higher temperature sublimes, without leaving any residue, in needles similar in appearance to benzoic acid. The sublimed caffeine is anhydrous*. The composition of caffeine deduced from the analyses of Pfaff, Liebig, and Wöhler, is $C_8 N_2 H_5 O_2$.

In the preparation of caffeine by means of the subacetate of lead, an abundant precipitate is formed, consisting of the caffeic acid and the tannin of coffee in combination with lead. When this precipitate is washed, and suspended in water, and a stream of sulphuretted hydrogen passed through till all the lead is precipitated, and the fluid filtered and evaporated, we obtain a gummy looking mass, which consists of caffeic acid, caffeates of lime, magnesia, &c. and the tannin of coffee. To separate

* Caffeine, by the action of caustic alkalies, is resolved into carbonic acid, formic acid and ammonia. With sulphuric and hydrochloric acids it forms crystallizable compounds. The action of fuming nitric acid and heat upon it, will be spoken of under *theine*.

these, we should digest the mass in cold alcohol, which dissolves out the tannin of coffee, and leaves the caffeic acid and caffeates. Boiling water separates the caffeic acid from the caffeates, which are insoluble.

Caffeic acid reddens strongly litmus paper: when decomposed by dry distillation, it gives out the odour of roasted coffee. Caffeic acid does not alter the colour of the salts of iron, it precipitates lime and barytes water; the precipitates are soluble in nitric acid. Caffeic acid colours the salts of copper green, and causes a dark green precipitate. The composition of caffeic acid has not been accurately determined, but it is composed of carbon, hydrogen, and oxygen, without any nitrogen.

Tannin of Coffee obtained by evaporating the alcohol, which has been digested on the tanno-caffeic acid described above, forms a brown mass, soluble in water and alcohol in all proportions; it colours the salts of iron green; it is converted by nitric acid into oxalic acid.

Roasted Coffee.—Coffee, by being roasted, loses weight, about 20 parts in 112; but this is chiefly water. The caffeine does not appear to be volatilized or altered, for it can be obtained from roasted coffee. In an experiment made for the purpose of determining the amount of caffeine in raw and roasted coffee—the same kind of coffee being used, I found that the roasted contained about one-sixth more than the raw. This might be accounted for by the loss of water in the roasting; but it is difficult to ascertain the exact quantity by the method used, from the sugar contained in the solution preventing the crystallization of the last portions of caffeine.

In the roasting of coffee, the caffeic acid and tannin appear to be altered, and the caffeine remains unchanged. The precipitate formed by the action of subacetate of lead in a decoction of roasted coffee, is of a dirty brown colour, instead of a bright yellow, such as is obtained from the decoction of raw coffee.

Tea.—There has been found in all kinds of tea a crystallizable substance, discovered by Oudry, called *Theine*, which has since been found to be identical with *caffeine*.

Besides this theine or caffeine, tea contains a great number of substances. as volatile oil, a species of tannin, gum, resin, chlorophylle, &c. The volatile oil exists in greatest quantity in the green teas, it has a very powerful odour; it becomes converted into a resin by the action of the oxygen of the air.

Theine.—To obtain it from tea several methods have been employed. It can be obtained by a similar method to that described for preparing caffeine, viz, precipitating the decoction with subacetate of lead, removing excess of lead by sulphuretted hydrogen, and then evaporating the filtered fluid, when crystals

of theine are formed, in fine needles or in prisms, according to the state of the fluid, as to dilution, acidity, &c. Dr. Stenhouse has prepared theine by a different process, founded on the volatile property of theine: he adds acetate of lead to a strong decoction of tea, evaporates to dryness, and then sublimes from a metal bath. The *theine* is then obtained in feathery crystals, like snow, anhydrous.

Tea-leaves dried, powdered, mixed with sand, and then heated on a bath, afford crystals of *theine*, without any preparation; but the heat must be carefully regulated, or an oily pyrogenous body is formed, which dissolves the theine.

The green teas do not contain so much *theine* as the black; the average proportion is about one per cent. In some extract of tea from China, given to me by Dr. A. T. Thomson, the quantity of theine was very large.

Now, it has been found that *theine* is identical with *caffeine*, and, therefore, the description of the properties of caffeine applies equally to theine. A test for theine or caffeine has been proposed by Dr. Stenhouse, which is the following:

Heat quickly a portion of *theine*, with two or three times its weight of fuming nitric acid, nearly to dryness, and to the yellow substance formed add a drop or so of ammonia, an intense purple colour is produced; so the test is the same as that for uric or lithic acids. It is very remarkable, that a substance having such a peculiar composition as *theine* or *caffeine*, should be found in both tea and coffee, for these plants do not belong to the same natural families. The peculiarity of their composition consists in their containing such a large amount of nitrogen; for, with the exception of urea and theobromine (a substance from cocoa to be presently described), caffeine contains more nitrogen than any other organic substance; and there is also the same ratio between the proportion of carbon and nitrogen in it, as there is in *taurine*, a crystallizable substance obtained from bile; but we shall speak more of this presently.

Tannin from Tea.—This is contained in the precipitate formed when the subacetate of lead is added to the decoction or infusion of tea. The tannin can be separated by passing sulphuretted hydrogen through the precipitate suspended in water. It seems to resemble the quercitanic acid; it blackens the solution of salts of iron. It seems to exist in tea in combination with the theine; and the compound is much less soluble in cold than in hot water, and this seems to cause a strong infusion of tea to become turbid when cold. More tannin is said to be contained in black than in green teas, as found by Sir H. Davy, and more recently by Dr. Stenhouse, although green teas appear from taste to be more astringent.

Theine or *caffeine* has also been found in the Guarana, a preparation from the Paullinia sorbilis, and it was called guaranine before the identity of the different substances was discovered. *Theine* has also been found in the Ilex Paraguensis or Paraguay tea, used by some nations in place of our common teas.

Theobroma Cacoa is the plant which yields the fruit from which cocoa and chocolate are prepared. The analysis by Schrader gave a peculiar extractive, similar to that he obtained from coffee, which extract of coffee, called also the bitter of coffee, contains the caffeine. Recently a substance has been obtained from cocoa, which has been called *Theobromine*, a crystallizable body, having a great analogy to caffeine. I do not know of any method given for its preparation; but I have been enabled to obtain it, by treating a strong decoction of the bruised nuts, after separation of the oily matter, by skimming the surface, with subacetate of lead, then filtering the fluid from the precipitate, and removing the excess of lead by sulphuretted hydrogen and evaporating; the theobromine, after a certain amount of concentration, falls, on the cooling of the liquid, in the form of a white powder, which does not appear crystalline. I have obtained it pure by subliming this white substance, when it rises in small opaque needles; but if the substance is not pure and an oily pyrogenous body rises with it, it assumes a crystalline form, in long needles.

Theobromine is a neutral body, not affecting vegetable colours. It is very insoluble in cold water, alcohol or æther; but much more soluble in the same when heated; acids also dissolve it. The composition of theobromine is $= C_9\ N_3\ H_5\ O_2$.

The common effects of infusions of tea, coffee, &c. are well known to all, viz., the antisoporific properties, and tea appears to act also as a sedative to the vascular system, when taken in large quantities, and to resemble in this respect digitalis. It is not my intention to dwell on these properties, but to endeavour to explain how they may act slowly yet effectually in a very different manner.

If we look at the composition of caffeine, theobromine, &c., and also take into consideration the fact, that they exist in tea, coffee, cocoa, and in other plants which have been used for the same purposes, by different nations, and chiefly by the sedentary, and those whose food consists in a great part of amylaceous principles, we cannot but suppose that their effects on the system must be beneficial. For what purpose, then, can they be used? Not as nutritive bodies (strictly speaking), for their composition has no analogy to that of the albuminous or proteine class of compounds. It cannot be supposed that they

act simply as tonics, though they are slightly bitter, because their composition is so very different from the simple neutral vegetable tonics, as salicine, piperina, &c., the quantity of nitrogen which they contain being so immense, much larger than in fibrin, or any other organic body, *urea* excepted.

Liebig supposes that they assist in the formation of the bile, and afford to that fluid one part of its composition; but in order to illustrate this, I must first give a short outline of his views with regard to the secretion, composition, and uses of the bile. Now he supposes, that the bile is one of the products produced by the decomposition of the animal tissues, and has shown, that in the carnivora, whose food consists of substances having the same composition as their blood, that their tissues may be resolved by the action of oxygen, which is taken in during respiration, into bile and urine. The composition of the tissue having the composition of the bile and urine, *plus* a certain amount of oxygen; but in the gramnivora, whose food consists in a great degree of substances belonging to the starchy compounds, and whose waste of tissue, and consequently production of bile by this means, must be small, from the little amount of exercise they take, these amylaceous bodies can help to the formation of that fluid, by combining with certain nitrogenized bodies found in the system. This, in most cases, must be urea, uric acid, and such bodies which result from the decomposition of their tissues which takes place.

Bile, according to the researches of Demarçay and Liebig, consists essentially of choleate of soda, or of a certain organic acid (choleic acid) in combination with soda. This choleic acid probably not being a simple substance, but, whether simple or compound, it contains all the elements of the essential organic part of the bile. It has this composition, $C_{76}\ N_2\ H_{66}\ O_{22}$.

It is a substance easily decomposed, being resolved by the action of mineral acids into another acid (insoluble in water) called choloidic acid (composition$=C_2\ H_{56}\ O_{12}$), and into ammonia, and a peculiar crystallizable substance, called taurine, which has this composition$=C_4\ N_1\ H_7\ O_{10}$.

By alkalies (caustic) it is resolved into another acid (fatty in its nature) called *cholic acid* (composition$=C_{74}\ H_{60}\ O_{18}$), and into carbonic acid and ammonia, in proportion to form *urea*. Now we find that both the choloidic and cholic acids contain no nitrogen, and could be formed from the elements of starch, by the separation of part of the oxygen, and if we supposed these to unite in the system with azotized substances having a composition similar to urea or taurine, then we can easily see how bile may be formed from these starchy compounds. But we must

first see whether such a separation of oxygen, from amylaceous bodies, ever does take place in the system, and then show what azotized bodies it can meet with.

We know that the animal body is capable of forming fat from such amylaceous compounds, as is seen in the fattening of animals on potatoes, &c., and in the formation of wax, by bees fed on pure honey. In the amylaceous class, the proportion of hydrogen and oxygen is such as would form water, and this is united to a certain amount of carbon; thus sugar (grape) is $C_{12} H_{14} O_{14}$, but in fat we find the oxygen in much smaller proportion, so that in the production of fat a certain amount of oxygen must be separated, the composition of all fats being between $C_{11} H_{11} O_1$ and $C_{12} H_{10} O_1$. Now, if we suppose the starch to lose a less amount of oxygen than in the formation of fat, we should have compounds formed having a composition similar to choloidic and cholic acids, and the production of such bodies is by no means improbable.

Now, in taurine we find the carbon and nitrogen to be in the ratio of 8 to 2; and the same is found in caffeine or theine, and they differ from each other only in the proportion of oxygen and hydrogen. In theobromine the carbon and nitrogen are in the ratio of 6 to 2; in urea in the ratio of 4 to 2: so if we suppose bodies formed having a composition analogous to choloidic or cholic acids, the union of these with bodies such as caffeine, theobromine, &c., would form a compound similar to the bile in composition.

That such combinations do take place in the animal body can be proved, for when we take benzoic acid=$C_{14} H_5 O_3$, we have it eliminated from the system in the form of hippuric (as Dr. Alexander Ure has shown), and to form hippuric from benzoic acid there must be an addition of certain azotized elements to the benzoic acid; in this case, as I have shown in the Transactions of the Chemical Society, Part II., the elements are such as would form lactate of urea, did such a compound exist, at any rate they are in the ratio to form such a compound, and both lactic acid and urea exist in the body. Now, this case is very similar to what we may suppose to take place in the formation of the bile in graminivora.

Asparagine is also an azotized substance found in asparagus, the mallow, liquorice, &c., and has a similar composition to taurine—the composition being $C_8 N_2 H_8 O_6$.

When the waste of tissue in man or animals is small, as in an artificial state of life, then the production of such substances as urea, &c., must also be small, and the constant use of substances containing such peculiar azotized compounds as caffeine, theine, theobromine, asparagine, &c., may assist materially in the formation of the bile, and Liebig has well shown that the bile is not an

excrementitial fluid, but serves some important office in the animal body: according to Liebig, it is the substance which serves for respiration; but for details on these subjects I must refer you to Liebig's work, time not allowing to do justice to the subject.

Before we leave the subject, it may be well to mention the close relation between caffeine, theine, theobromine, asparagine, and taurine, urea and uric acids.

1 at. Caffeine..	=	C_8	N_2	H_5	O_2	1 at. Asparagine..	=	C_8 N_2 H_8	O_6
9 at. Water ...	=			H_9	O_9	6 at. Water	=	H_6	O_6
9 at. Oxygen...	=				O_9	8 at. Oxygen.....	=		O_8
=2 at. Taurine...	=	C_8	N_2	H_{14}	O_{20}	2 at. Taurine.....	=	C^8 N_2 H_{14}	O_{20}

Again,

1 at. Theobromine = C_{18} N_6 H_{10} O_4 + Water 22 + 16 Oxygen.
= 4 at. Taurine + 1 at. Urea.
1 at. Theobromine + 24 Water + 16 Oxygen.
= 4 at. Taurine + 2 Carbonic acid + 2 Ammonia.
1 at. Theobromine + 8 Water + 14 Oxygen.
= 2 at. Taurine + 1 at. Uric acid.

The quantity of caffeine or theine being so small (in tea about one per cent.), might be urged as an objection to the theory; but according to calculation, supposing $\frac{1}{10}$ part of the bile to consist of solid matter, and this solid matter to be choleic acid, which contains 3.87 per cent. of nitrogen, then it is found that $2\frac{8}{10}$ grains of caffeine would give to 480 grains of bile, the nitrogen it contains in the form of taurine.

Now, from what we have seen, viz., from the identity of caffeine and theine, and the similarity in composition of theobromine and asparagine—from their being found in plants so dissimilar in a botanical point of view—from their being instinctively used by almost all nations—from their peculiar highly azotized composition—from their immediate physiological effects on the system being so little (thus differing greatly from strychnia, and such vegetable compounds which contain less nitrogen)—from their similarity in composition to taurine, I think we cannot but be inclined to consider that they have an important effect on the body, and certainly the theory of Liebig is not improbable, and deserves the greatest consideration.

Dr. Ure, in allusion to the fact stated by Mr. Garrod in his paper, that coffee contained tannin, said it had been mentioned some years ago by Chenevix, that no tannin existed in raw coffee, but that it was found in the coffee after being roasted. He had himself very carefully examined coffee, but was unable to detect any tannin in it by means of gelatine, either in the roasted or unroasted state. He wished to know whether Mr. Garrod had used gelatine for determining the presence of tannin during his

experiments, as he believed he mentioned only acetate of lead as the re-agent employed.

Mr. Garrod replied that he had not tested the coffee with gelatine.

The Chairman stated, that as the Anniversary of the Society would be held next month (May), there would, consequently, be no evening meeting held as usual; but that Dr. Thomson would deliver his introductory lecture on Botany on the evening of Wednesday, the 10th of that month.

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Culverwell on Bathing	1829	
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Letter to Dr. Chambers on Gout, by Sir C. Scudamore	1839	
Falconer on Bath Waters		

DONATIONS TO THE MUSEUM.

Messrs. Davy, Macmurdo, and Co.—Zinci Oxydum (prepared according to the Pharmacopœia).

Messrs. Fisher, Toller, and Co.—Balsamum Giliadense.

Mr. R. Alsop.—Piece of a branch of the Aloë Spicata plant.

Messrs. Howards and Kent.—Calomel, sublimed in glass, crystallized—Calomel, condensed by cold air, crystallized—Ditto, in powder, but not sufficiently fine for use—Calomel, as usually sold by Messrs. Howards and Kent—Calomel, hydrosublimed.

John Harrison, Esq., *Charles Street.*—Specimen of Woorari Poison, from the Museum of the late Mr. Walker.

Mr. Woolley, *Regent Street, Westminster.*—Specimen of English Rhubarb.

Dr. Royle.—Specimen of Aconitum ferox root.

Messrs. Horner and Son.—Clove Bark—Sassafras Nuts—False Jalap.

Mr. Samuel Summers, Jun.—Hippuric Acid.

Mr. Thomas Southall, *Birmingham.*—Syrupus Papaveris—Potassii Iodidum.

Messrs. Allen, *Cowper Street, Finsbury.*—Unguentum Hydrargyri—Pilula Hydrargyri (made by steam apparatus).

Messrs. Winstanley and Son.—Aloes Wood—Sassafras Nuts—Stick Lac—Gum Ladanum—Gum Tacamahac—Gum Citrinum—Red Coral—Inodorous and Tasteless Nutmeg—Flea-wort Seed.

Dr. Pereira.—Specimen of Potato Sugar.

Mr. Mennie, *Plymouth.*—Rhamnus frangula.

Mr. Squire.—Moist preparations of roots of Althæa Officinalis—Helleborus Niger—Valeriana Officinalis—of flowering plant of Colchicum Autumnale.

Mr. Gilbertson, *Pilgrim Street.*—Large glass Displacement Apparatus.

Mr. Savory.—Extractum Urticæ Dioicæ.

SYNOPSIS OF A COURSE OF LECTURES ON GENERAL AND MEDICAL BOTANY.

BY A. T. THOMSON, M.D., F.L.S., &c.

Introduction — Definition of Botany — its advantages as a science — practical advantages derived from a knowledge of it—Method of studying it.

Botany has reference to the external or physical characters and the struc-

ture of Plants—their vital actions, and their classification; hence it may be divided into *Structural*, *Physiological*, and *Systematic*.

Definition of a Plant—distinction between Plants and Animals.

I. STRUCTURAL BOTANY is—

A. Particular—comprehending,

1. Organs essential to the individual life of the species.
2. Organs essential for the reproduction of the species.

B. General—comprehending elementary organs common to both the former.

A. 1. ORGANS ESSENTIAL TO INDIVIDUAL VEGETABLE LIFE.

a. Roots — fibrous — ramose — creeping — aërial — fusiform —spongioles.

Appendages—cormi—tubers—bulbs.

Underground Stems—rhizomes.

Functions of Roots—endosmose:—many Roots are reservoirs of vegetable secretions — those employed as medicinal agents described.

b. Stems—divided into—1. those which increase from without —*Exogens*; 2. those which do not increase from without—*Endogens*.

1. Structure of exogenous stems—pith—wood—bark—branching—growth in diameter and length.
2. Structure of endogenous Stems—in Palms—Liliaceæ — Iridaceæ—Grasses—Ferns: — branching of Endogens.

Appendages—pubescence—spines—prickles.

c. Leaves—1. Unexpanded—leaf-buds—vernation.

2. Expanded—simple and compound—varieties of form —position upon the stem :—appendages—stomata—hairs—stings—pubescence. Formation of Leaves—growth—leafless plants.

d. Stipules—bracts—tendrils.

A. 2. ORGANS OF REPRODUCTION.

e. Flower—definition of the — arrangement of, in the plant or inflorescence.

f. Floral envelopes—calyx—corolla:—imperfect flowers.

g. Generative organs—stamens—pistil—ovary.

h. Offspring—ovules—fruit—seed—embryo.

B. ELEMENTARY ORGANS—

a. Cellular tissue.
b. Vascular tissue.
c. Glandular tissue.
d. Woody fibre.
e. Epidermis.

II. PHYSIOLOGICAL BOTANY.

Cohesivenesss—permeability—irritability—movements of plants —endosmose—exosmose—ascent of the sap—respiration—secretion —excretion—transpiration—odours — temperature — assimilation and growth—fertilization—age—decay—fall of the leaf—germination of seeds—reproduction of asexual plants.

III. SYSTEMATIC BOTANY.

a. Artificial System—species and varieties—genera—classes—orders.

b. Natural System—orders illustrated by the medicinal plants arranged in them.

OTHER ORIGINAL COMMUNICATIONS.

REMARKS ON THE PHARMACOPŒIA OF THE ROYAL COLLEGE OF PHYSICIANS OF EDINBURGH,

AND ON

DR. CHRISTISON'S DISPENSATORY, OR COMMENTARY ON THE PHARMACOPŒIAS OF GREAT BRITAIN.

BY RICHARD PHILLIPS, F.R.S., &c.,
Honorary Member of the Pharmaceutical Society.

A NEW edition of the Pharmacopœia of the Royal College of Physicians of Edinburgh, appeared in 1839, and soon afterwards I published some observations upon it in the *Medical Gazette*. These I had intended to continue, but I was induced to desist from so doing, on account of its being understood that Dr. Christison, then the President of the Edinburgh College, was engaged in preparing a Dispensatory; before, however, this made its appearance, another edition of the Edinburgh Pharmacopœia was required and published.

In the preface to the latter edition, the College observe, that "few additions have been called for," and, consistently with this statement, I find that Canna, only, has been added to the Materia Medica; and to the preparations, Acidum Aceticum aromaticum, Infusum Senegæ, Iodinei Liquor compositus, and Ferri Iodidi Syrupus; on the other hand, there have been omitted Decoctum Senegæ, Ferri Iodidi Solutio, and Tinctura Veratri.

"We have," say the College, "rectified several errors, which have occurred to ourselves, or have been pointed out by various critics;" and, on examination, I actually find that in the Materia Medica alone, about seventy-five alterations have been made, besides about one-third of this number of corrections of the wrong use or neglect of capital letters, which were pointed out by me.

It is further observed by the College, "we have made some extensive changes, particularly in the formulas for pills and tinctures," and, it is added, that "in general little alteration is made in their composition, and scarcely any in their strength."

I was curious to discover how "extensive changes" could be effected in the mode of preparing medicines without considerably altering their composition or strength. On examination, I find the case to be, with respect to pills, that whereas, in the first edition, of the twenty-three formulas for pills, the ingredients of twenty were apportioned by weight, they are now to be taken by parts; with regard to the tinctures, of the fifty-six contained in the work, the ingredients of fifty-four are now apportioned to two pints of the solvent, eighteen only being so before, and two tinctures remain unchanged. These alterations afford ample evidence of the difference between extent and importance.

I admit, however, that no harm has accrued to the pills, and that uniformity with the London College has arisen from the alterations in the preparation of the tinctures.

In the methods of preparing some medicines, greater and more important alterations than those just noticed have been effected, and these, except in two cases, are in a great degree in accordance with my suggestions. Indeed, I shall show in the sequel, that, with few exceptions, where I ceased to detect errors, the College ceased to correct them.

On discontinuing my remarks in the *Medical Gazette*, I stated that I should do so, trusting that some difficulties which had occurred to me, might be explained in Dr. Christison's forthcoming work. I cannot say, however, that my anticipation has been realized; for, except in the solitary instance of the formula for Acidum Hydrocyanicum, I am not aware that a single improvement has been effected, which I had not shown to be requisite.

Under these circumstances I shall renew my observations on the Edinburgh Pharmacopœia, and of course include with them such as may arise from Dr. Christison's defence of it, or may be suggested by his criticisms on the London Pharmacopœia, or on my translation of that work.

I shall commence with the Materia Medica, the first article of which, requiring notice, is Acetum Britannicum; in the first edition it was stated, that its density varied from 1006 to 1012; I showed that it is as high as 1019, and the College have corrected the statement accordingly; Dr. Christison, by a mere misprint, has 10019, instead of 1019. I mentioned also, that British vinegar may legally contain about three times as much sulphuric acid, as would be indicated by the test of the Edinburgh Pharmacopœia, for the extreme admissible quantity. Dr. Christison now asserts, that having examined "twelve different specimens of French and British manufacture, less [nitrate of barytes] is sometimes sufficient; but more is never required."

I have already admitted this to be the case with respect to French vinegar, and it may be so with the Scotch vinegar, provided the manufacturers are more scrupulous than the English; but "the College has excluded these vinegars intentionally." Now, whether four ounces of vinegar contain one grain and three-quarters of sulphuric acid, as permitted by the London College and the excise laws, or half a grain, as allowed by the Edinburgh College, is a matter of no consequence whatever, for the latter college do not employ it in any preparation without distilling it; and if they did it would do no harm.

Dr. Christison remarks (p. 12), that the method of the London College "of ascertaining the absence of an undue proportion of sulphuric acid, in which the operator has to collect and weigh a

precipitate amounting to 1.14 grain, is much too tedious and refined for practical use."

Under the head of Cinchona flava (p. 16), of the Edinburgh Pharmacopœia, the following are the directions for ascertaining its quality: "A filtered decoction of 100 grains in two fluid-ounces of distilled water gives, with a fluid ounce of concentrated solution of carbonate of soda, a precipitate, which when heated in the fluid becomes a fused mass, weighing when cold 2 grains or more, and easily soluble in solution of oxalic acid." Now, let us compare the *tediousness* of these operations of the two Colleges. In the London process we have, 1st, To prepare a solution of chloride of barium; 2dly, To add it to an ounce of vinegar; 3dly, To collect the precipitated sulphate of barytes; 4thly, To dry it; 5thly, To weigh it. According to the Edinburgh Pharmacopœia, there is, 1st, To boil 100 grains of bark in two ounces of water; 2dly, To filter the decoction; 3dly, To prepare the solution of carbonate of soda; 4thly, To heat it, and the decoction of bark together; 5thly, To separate the fused mass; 6thly, To weigh it; 7thly, To prepare a solution of oxalic acid; 8thly, To ascertain the solubility of the two grains of the fused mass therein.

With respect, then, to tediousness, it is greater in the process of the Edinburgh college than that of the London, in the proportion of eight to five; and the degrees of refinement are, as far as I can discover, not very different. If the bark should be of bad quality, it must be evident that the operator may have to weigh even less than a grain; and if he will employ two ounces of vinegar instead of one, then the precipitate of sulphate of barytes will exceed in weight the fused mass obtained from the 100 grains of bark.

Under these circumstances I think that the charges brought by Dr. Christison come with a bad grace from him; at the same time I readily admit, that the principle of the Edinburgh College, if correctly carried out, is more easy of application in the testing of vinegar than that of the London College.

Acetum Destillatum.—In the first edition, the College directed six parts only of vinegar to be distilled from eight parts. I showed in the *Medical Gazette*, that by this process only about three-fifths of the vinegar were actually procured. The Edinburgh College have now, in accordance with the London College, and with the results of my experiments, directed seven parts of product to be distilled, instead of six, and in addition to the consideration of economy urged by me, Dr. Christison has assigned other valid reasons for the alteration effected.

Acidum Aceticum.—In the first edition of the Edinburgh Pharmacopœia, the following formula was introduced:—

"ACIDUM ACETICUM.—Take of Acetate of lead any convenient quantity: heat it gradually in a porcelain basin by means of a bath of oil or fusible metal (8 tin, 4 lead, 3 bismuth) to 320° F.; and stir till the fused mass concretes again: pulverize this when cold, and heat the powder again to 320°, with frequent stirring, till the particles cease to accrete. Add six ounces of the powder to nine fluidrachms and a half of Pure sulphuric acid contained in a glass mattrass: attach a proper tube and refrigeratory; and distil from a fusible-metal-bath with a heat of 320° to complete dryness. Agitate the distilled liquid with a grain or two of red oxide of lead to remove a little sulphurous acid, allow the vessel to rest a few minutes, pour off the clear liquor, and redistil it. The density should be not above 1065."

In the *Medical Gazette*, I made several remarks on the more glaring imperfections of this process, and offered what I believed to be the only possible excuse for its introduction, namely, that it had never been tried. It now appears that this apology is no longer admissible, for from what Dr. Christison states, the process appears actually to have been attempted, and my wonder is therefore doubled that it should be retained.

After trying to perform the process described, but with very imperfect success, I stated numerous objections to it: *first*, Acetate of lead may be rendered anhydrous by exposure to a heat of 212°, with occasional stirring, instead of requiring, as directed, continual stirring, a temperature of 320°, obtained by the inconvenient and expensive method of a fusible metal-bath, or the disagreeable and dangerous one of an oil-bath. *Secondly*, The employment of a thermometer required when either a metal or oil-bath is used, is extremely troublesome, and it is very difficult, even with constant watching, to keep the fusible metal at the temperature directed, for it is very apt to rise above it; and, at a very few degrees below it, the mixed metals become solid. *Thirdly*, On account of the tenacity of the mixture of the sulphuric acid and acetate of lead, there is great difficulty in effecting a perfect admixture of them. *Fourthly*, The residual sulphate of lead, on account of its insolubility, is with difficulty removed from the matrass. *Fifthly*, Acetate of lead is more costly than acetate of soda, in the proportion of fourteen to ten. *Sixthly*, The last mentioned salt leaves a residue of sulphate of soda, easily washed out of the matrass. *Seventhly*, In expelling the water from the acetate of lead, the College give the operator the choice of two bad methods of effecting it, while in distilling the acid, they restrict him to the use of the worse. *Eighthly*, I showed that "a grain or two" of red oxide of lead could remove only $\frac{55}{100}$ of a grain of sulphurous acid, or from about 1-4000th to 1-2000th of the weight of the product of acetic

acid. *Ninthly*, In page 2 of the Pharmacopœia, it is stated, that the density of the acid is "not above 1068.5," while at page 44 it is directed that the density should "be not above 1065."

In the second edition this process is retained, accompanied with all its principal bad qualities; some of the details are however corrected to a certain extent, not indeed, as in other instances, in accordance with the remarks which I offered, but in avoidance of the more tangible errors of the original; for example, for "a grain or two of red oxide of lead," we find now "a few grains;" and at page 2, the acetic acid is directed to have "a density not above 1068.5," as on the former occasion; whereas at page 48, it is stated that "the density is commonly from 1063 to 1065, but must not exceed 1068.5."

Dr. Christison (p. 7) after stating the composition, and giving the symbols of acetic acid, observes, that the "hydrated acid ($\bar{A}$ + Aq.) contains of course an additional equivalent of hydrogen and oxygen. The density of this when accurately prepared is 1063; but it often reaches 1065, owing to the presence of a little additional water. When of the former density one hundred minims (97 grains) neutralize nearly 242 grains of crystallized carbonate of soda." It follows therefore, that 100 grains of this acid neutralize 249 grains of carbonate of soda=eighty-nine grains of real acid, adopting the same equivalents for acetic acid and the carbonate as Dr. Christison does. This acid consequently consists of 11 water and 89 real acid, which are nearly in the proportion of 9, one equivalent of water to 73 of real acid, instead of 9 to 51.48 the strongest known, and mentioned by Dr. Christison as such; the error consequently amounts to above twenty-one parts of real acid.

Nor is this all: in the above quotation we are informed, that acetic acid, when accurately prepared, has a density of 1063; "but it often reaches 1065;" now nothing is here said of acid of sp. gr. 1068.5, which, according to the Pharmacopœia, the product may not improperly possess. Let us, then, compare the strengths of the acids of the various densities which the College must suppose to be nearly similar, with the statement of that of 1063, according to Dr. Christison, and of the stronger of 1068.5, according to the table which he has quoted; the first, I have just shown, must contain eighty-nine per cent., while, for the second, the table gives eighty-two. This difference, amounting to seven per cent., surely cannot be owing, as described by Dr. Christison, "to the presence of a *little* additional water."

This mis-statement of the saturating power of acid of 1063, is repeated so distinctly, that there is no occasion merely to infer it. Dr. Christison says, "between 1063 and 1077.7 the same density may indicate an acid of two very different degrees of

strength, the weaker of which is in fact, at 1063, less than half as strong as the stronger; while that of 1077.7 is intermediate, —the neutralizing power of 100 grains of these three acids being about 118, 186, and 250, as determined by the carbonate of soda." Adopting, as before, the same equivalent numbers as Dr. Christison, the acid saturating 250 must contain 89.73 per cent. of real acid, and consequently consist of one equivalent of acid and about two-thirds of an equivalent of water—a compound which I need hardly say, has never been formed.

Dr. Christison characterizes the tests of the London College for ascertaining the purity of acetic acid, as "unnecessarily minute." He does not seem to be aware that nitric and hydrochloric acid are occasionally used to adulterate this acid, but I have found both of them. Indeed, he says, that muriatic acid "does not occur as an adulteration."

There are many observations of Dr. Christison respecting acetic acid, which require correction: for example, he states, with respect to what he, in defiance of all modern and just chemical views, calls pyroligneous acid, that "it varies much in density, and therefore in strength," it ought of course to follow, that agreement in density should indicate similarity in strength; but it will appear from the table which Dr. Christison has inserted, that acid of 1068 may contain either 97 or 37 per cent. of hydrated acetic acid.

Dr. Christison observes (p. 5), that "the London College does not admit the pure acetic acid; while, with a disregard of correct nomenclature, which suits ill with its professions of accuracy in this respect, the name has been given to a weak acid about the density of 1050, containing not much above a third of its weight of the pure acid of the Edinburgh Pharmacopœia." Whatever may have been the *professions* of accuracy of the London College it appears to me that they have at least endeavoured, as fully as the subject would admit of, to employ a consistent nomenclature; at any rate they have not adopted the avowed "patchwork" of the Edinburgh College.

Some critics are extremely difficult to please: because acetic acid contains more water than is absolutely requisite, we may infer that, according to Dr. Christison, it should have been called *impure* acetic acid; on the other hand, when potash containing only the proper quantity of water is called *hydrate* of potash by the London College, then it is "the newest and most refined" name for that substance, although it has been so called for more than a quarter of a century.

There are other statements contained in Dr. Christison's observations respecting acetic acid, which require correction, but having extended my observations on this subject to a great

length, I shall close them with briefly noticing his opinions with respect to rendering acetate of lead and acetate of soda anhydrous, and on one other subject.

"Of acetate of lead," Dr. Christison says, that "the chief difficulty lies in depriving the salt entirely of its water of crystallization. Spontaneous evaporation is too tedious a method of attaining this end; and the process is not sufficiently accelerated either in a confined space of air kept dry with sulphuric acid, or even by substituting a vapour-bath heat. But in a vacuum, with sulphuric acid to absorb the moisture, the crystallized acetate parts with the whole of its water in thirty-six hours; and this method is obviously applicable on the large scale."

In the *Medical Gazette* I stated, and I repeat the assertion, that acetate of lead is with great facility rendered anhydrous by exposure to the heat of steam. Dr. Christison, indeed, informs us that acetate of soda "is not so easily reducible as the acetate of lead to the anhydrous state without the escape of acid or charring of the residual salt." Again I repeat, what I before asserted, that this salt may be rendered anhydrous, and without either the loss of acid or charring, by exposure to a temperature of 212°. I venture also to state, that the method by sulphuric acid is obviously *inapplicable* on the large scale; and that what is described as "the more convenient method" of using a bath of oil or fusible metal is as inconvenient as possible.

It is, indeed, true that an equivalent of acetate of soda, as it contains more water than an equivalent of acetate of lead, requires longer exposure to heat to render it anhydrous; I found, for example, that 2740 grains of the soda salt, representing twenty equivalents, become anhydrous by exposure to 212° during seventeen hours, while 3800 grains of the salt of lead, also representing twenty equivalents, required only twelve hours to produce the same effect.

Dr. Christison (Dispensatory, p. 6) referring to the method of the London College for obtaining acetic acid, says "the process for the weaker London acetic acid will be noticed under the head of pyroligneous acid, of which it is really a variety. The salt used in that process, the acetate of soda, is preferable to all other acetates in point of cheapness."

I am quite at a loss to conjecture what is meant by terming the acetic acid of the London Pharmacopœia a "variety" of pyroligneous acid; indeed in p. 9 it is stated to be "nothing else than pyroligneous acid," because "it is produced from the acetate of soda, which is prepared from wood by destructive distillation." If this be the case, what then is the "*pure* acetic acid of the Edinburgh Pharmacopœia," which is produced from the acetate of lead, prepared by express direction from pyroligneous acid," obtained from wood by destructive distillation? (*Edin. Pharm.* p. 111.)

PLANTS WHICH MAY BE GATHERED, OR THEIR ROOTS DUG UP IN THE MONTH OF MAY.

Common scurvy-grass, Cochlearia *officinalis;* Wood-sorrel, Oxalis *acetosella;* Lesser spearwort, Ranunculus *flammula;* the Odorous violet, Viola *odorata;* Rosemary tops, Rosmarinus *officinalis;* roots of Taraxacum, Taraxacum *dens leonis;* roots of Mallow, Malva *sylvestris;* roots of Bistort, Polygonum *bistorta.*

RHAMNUS FRANGULA (Lin).
"*Black Alder.*"

TO THE EDITOR OF THE PHARMACEUTICAL JOURNAL.

Dear Sir,—I have frequently had opportunities of witnessing the good effects of the black alder, of which I send you a specimen, with a formula for the decoction.

It is purgative, alterative, &c., useful in secondary syphilis, chronic rheumatism, and cutaneous disorders.

Decoction—One ounce of the bark gently boiled in a pint and a half of water, till reduced to a pint. A wine-glassful to be taken twice or thrice daily.

Yours truly,
George Mennie.

Plymouth, April 7th, 1843.

SICKNESS OCCASIONED BY EATING THE ROOT OF FRENCH BEANS.

TO THE EDITOR OF THE PHARMACEUTICAL JOURNAL.

1, *Brettin Terrace, Chelsea, April* 18, 1843.

Dear Sir,—A customer of mine last Christmas was digging up some roots of the French Beans or Scarlet runners, and observing them to be very large and look very white when broken, thought he would taste them, thinking there could be no harm in partaking of the root of a vegetable which had formerly supplied his table. His family and maid-servant being also in the garden all partook of some—pronouncing them good and pleasant to the taste; presently the servant complained of giddiness and sickness, and whilst rendering assistance, the master himself, with the mistress and five children, followed in the train; the sickness continuing for half an hour.

I remain, dear Sir, yours truly,
W. Bartlett.

THE WHITE LINIMENT.

℞ Olei Terebinthinæ Rectificati, ℥ij.
Liquoris Ammoniæ, P. L. ℥ij.
Linimenti Saponis, ℥iij.
Spiritus Rosmarini, ℥j.
Aceti distillati, ℥viij.

The ingredients to be mixed in the above order, adding the vinegar gradually with continual agitation.

[This formula is inserted at the request of a Correspondent. When properly prepared, the liniment is white, and in consistence resembles thick cream; it is an efficacious application for chapped hands.—Ed].

Mr. Thomas Southall, of Birmingham, has favoured us with a few observations on various subjects, among which are the following:—

ON FACTITIOUS DRUGS.

I believe there are few substances used by Druggists of which a factitious kind is more frequently to be met with than Burgundy pitch; indeed, I have seldom met with this article genuine in retail shops, and I have seen compound Burgundy pitch plaster, which had been procured from a respectable house in London, in which genuine Burgundy pitch was not part of its composition.

[Dr. Pereira confirms this statement observing, that most of the substance sold as Burgundy pitch in the shops is fictitious. "Its principal constituent is resin, rendered opaque by the incorporation of water, and coloured by palm oil. One maker of it informed me, that he had prepared it from old and concrete American turpentine."—*Materia Medica*, 2d edit. p. 1059].

We have for a considerable time past been unable to procure genuine sagapenum, having bought an article under this name which appeared to be a compound of asafœtida, olibanum, and galbanum. In the samples which we have recently obtained, pieces of pure asafœtida might be picked out, the remainder being evidently galbanum.

I think it should be generally known, that a large proportion of the article commonly offered for sale as sesquioxide of iron, is different from the article ordered in the Pharmacopœia, in consequence of its having been submitted to a strong heat, for the purpose of improving its colour. I know this to be the case, not only from the result of an examination of several samples, but from the acknowledgment of two large manufacturers of the article.—T. S.

[Another correspondent informs us, that Venetian red is extensively used for giving a bright colour to sesquioxide of iron, and that a compound thus prepared is sold at eightpence per pound.—Ed]

PRECAUTIONS NECESARY IN THE USE OF CHEMICAL TESTS.

TO THE EDITOR OF THE PHARMACEUTICAL JOURNAL.

Charing Cross Hospital,
April 2d, 1843.

My dear Sir,—Allow me to correct a trifling error which has crept into the report of a conversation which took place at the last meeting of the Society, after the reading of Mr. Howard's paper on the Precautions required in the Use of Chemical Tests.

I stated, that a simple and excellent method of detecting an admixture of alkaline chloride in iodide of potassium, was to add to the solution of the salt an excess of nitrate of silver, and afterwards to digest the mixed chloride and iodide of that metal in ammonia, whereupon the former would be dissolved, and the latter left almost untouched. The addition of nitric acid to the filtered ammoniacal solution, would again precipitate the chloride. (See No. for *February* last).

I also alluded to the possibility of nitrate of silver being adulterated with nitrate of lead, and mentioned the plan which the Chemist would pursue to discover the amount of such falsification. This plan consists in adding to a *dilute* warm solution of the salt, a slight excess of hydrochloric acid, which throws down the whole of the silver in the state of insoluble chloride, and leaves the lead in solution, chloride of lead being to a considerable extent soluble in water.

Believe me to remain, most truly yours
George Fownes.

INSPISSATED JUICES.

TO THE EDITOR OF THE PHARMACEUTICAL JOURNAL.

Dear Sir,—I wish to draw your attention and that of the Members of the Pharmaceutical Society generally, to a statement made by Mr.Squire at the last Pharmaceutical Meeting, on the average quantity of extract produced from a pint of expressed juice.

I can testify to your correctness, as to the remark made by Mr. Squire, namely, that "six pints of juice would not produce more than six or seven ounces of extract." In my own experience I have found, that instead of their producing on an average but $\frac{1}{20}$th part of extract, they produce from $\frac{1}{10}$th to $\frac{1}{4}$th.

The following is the average produce that I have obtained :

℥xx.	Succi	Belladonnæ .	℥ij. ℥iij.
℥xx.	"	Conii . .	℥ij. ℥v.
℥xx.	"	Digitalis .	℥ij. ℥iss.
℥xx.	"	Hyoscyami .	℥ij. ℥ij.
℥xx.	"	Lactucæ .	℥ij. ℥vj.
℥xx.	"	Taraxaci .	$\frac{1}{4}$ to $\frac{1}{8}$.

I remain, dear Sir, yours truly,

W. Hooper.

7, Pall Mall East, April 20th, 1843.

[The amount of product from a given quantity of juice would be affected by the quantity of water with which the plant had been moistened, before the juice was expressed. See p. 639.—Ed.]

EXTRACTED ARTICLES.

METHOD OF OBTAINING PURE SILVER,

EITHER IN THE METALLIC STATE OR IN THE FORM OF OXIDE.

BY W. GREGORY, M.D., F.R.S.E.

The Chemist, as well as the Metallurgist, has frequent occasion to purify silver, especially from copper, which is dissolved along with it by nitric acid, the proper solvent of silver. By converting the silver into the insoluble chloride, it is effectually purified from copper as well as from all other metals, the chlorides of which are soluble. But here the difficulty begins ; the chloride of silver is a very unmanageable product, at least in the moist way. It is true, that if placed in water acidulated with hydrochloric acid, in contact with zinc or iron, the chloride of silver is reduced. But the process is tedious, seldom complete, and in the end unsatisfactory, for some zinc adheres to the reduced silver, so that it is not removed by digestion with moderately strong hydrochloric acid. This is proved by the action of ammonia, which extracts a good deal of oxide of zinc. Moreover, the zinc or iron is hardly ever pure, and its impurities, arsenic, carbon, and perhaps also copper and tin, remain with the silver. I have never got from silver thus reduced a colourless solution of nitrate.

After describing the objections which attach to the different methods which have hitherto been adopted for obtaining the silver in a state of purity, the author says,

The following method appears to me the most advantageous :—

The cupreous solution of silver is precipitated by common salt, while hot, and the chloride of silver well washed by decantation with hot water. It should also be broken down with a spatula of platinum, or a glass rod, during the washing ; but not ground in a mortar, which causes it to cake, and impedes the action of the potash. The chloride, *while still moist*, is covered to about half an inch with a solution of caustic potash, specific gravity 1.25 at least, and then boiled. During the boiling, which is best performed in a capsule of clean iron, silver, or platinum, the chloride is to be well stirred, in order to bruise all curdy or lumpy particles. If a small

portion, taken out and washed, do not dissolve without residue in dilute nitric acid, the potash is to be decanted off, and the powder, still moist, is to be well rubbed down in a mortar, which may *now* be done with advantage. It is then returned into the capsule, and again boiled for five minutes with the same or with fresh potash. It will now dissolve entirely in nitric acid, but if not, a second grinding will infallibly succeed. It is now only necessary to wash the oxide, which is completed by decantation in a few minutes, as the powder, from its great density, sinks at once to the bottom. The first two or three washings are made with hot water, the remainder with cold water, for when the oxide is nearly washed, it rises partially to the surface with *hot water*, and thus a loss is occasioned in decanting. Of course, the whole washings (except the first, owing to the strength of the potash) may be conducted on a filter. But the powder is so fine, that probably a good deal would adhere to the paper when dry.

This oxide of silver appears in a form quite distinct from that of the oxide precipitated by potash from the nitrates, and is hitherto undescribed. It is very dense, homogeneous, and has a pure black colour, which has, if anything, a tint of blue, whereas the common oxide is bulky, far less dense, and of a greyish brown colour. They appear, however, to be chemically identical. Not having a microscope, I have not studied their physical characters minutely, but I suspect, from its aspect in the liquid in which it is formed, that the new oxide is crystalline.

It is obvious, that the above process furnishes an easy method of procuring a very pure oxide of silver, and of course the action of heat gives us the silver in the state of metal. It is, I conceive, applicable both to the manufacture of nitrate (in a state of absolute purity) and to the metallurgic process for obtaining pure silver. For both objects, it is a matter of no consequence if some chloride should have escaped the action of the alkali. This chloride is left undissolved by the nitric acid, and is separated by filtration, while if the oxide (not quite free from chloride) be mixed with a little nitre or carbonate of potash, and fused, the whole silver is obtained with the utmost facility. In order to give an idea of the ease with which the whole is performed, I may mention, that I dissolved a half-crown, and obtained the whole of the silver it contained, within a very trifling fraction (chiefly decanted in the *first* washing of the chloride, *but not lost*) by the above process, *within two hours*, in a fused state. The silver was quite pure. There is no doubt that to Chemists, also, an easy method of obtaining quickly, pure oxide of silver, in a form much less hygrometric than the usual one, will be acceptable.

It is particularly to be noticed, that if the chloride *have once been dried*, it is with great difficulty decomposed, even by a long boiling with potash.—*Philosophical Magazine.*

ON PROTOSULPHURET OF IRON,

AS AN ANTIDOTE FOR CORROSIVE SUBLIMATE.

In Vol. II., No. 6, of this Journal, we inserted a note by M. Mialhe, in which he states, that the peculiar taste, caused by a solution of corrosive sublimate in the mouth, is immediately removed by introducing some of the hydrated protosulphuret of iron, mixed with a little water, to the part; and he therefore recommended this sulphuret as the best antidote in cases of poisoning with corrosive sublimate.

M. Orfila has subsequently instituted some experiments, with the view of determining the value of this antidote; and the following are the results of his investigation, which we extract from the *Journal de Chemie Médicale:*

1st. That the protosulphuret of iron completely destroys the poisonous

properties of corrosive sublimate, if administered in sufficient quantity *immediately after* the ingestion of the poison.

2d. That, like the other most approved antidotes for this poison, it is inefficacious, unless given within about ten or fifteen minutes, by which time the deleterious action of the poison is generally sufficiently powerful to cause death.

3d. That although the sulphuret decomposes the corrosive sublimate more powerfully and completely than *albumen*, and, therefore, ought to be preferred in all cases where it can be administered *immediately*, or in *a very short time* after the poison; yet it will almost always be found that *albumen* may be more advantageously resorted to than the sulphuret of iron, in consequence of the latter being kept only by the Pharmaceutists, and much time being, therefore, lost before it can be administered, while white of egg mixed with water, which is every where to be obtained, may be given without delay.

PREPARATION OF PYROGALLIC ACID.

BY DR. JOHN STENHOUSE.*

The usual method of procuring pyrogallic acid is by cautiously distilling either gallic or tannic acids. The pyrogallic acid is obtained partly as a crystalline sublimate, and partly dissolved in the empyreumatic liquor, which passes into the receiver. Pyrogallic acid, thus procured, is very seldom free from empyreumatic oil, from which it can only be purified by repeated distillations; in each of which much acid is unavoidably lost. The usual method, therefore, of procuring pyrogallic acid by distillation is troublesome and unproductive. The process which I have found most advantageous for preparing it in quantity is the following:

Finely powdered gallnuts are to be treated with successive portions of cold water till they are exhausted. These extracts are then to be evaporated and strongly dried, till all their hygrometric water is driven off. In this state they form a spongy deliquescent mass, in taste and colour very much resembling catechu. Instead of distilling this dried extract in a retort, it is much better to employ Dr. Mohr's apparatus for subliming benzoic acid. It consists of a cast-iron pan, from three to four inches deep, and from eighteen inches to two feet wide. The dried extract is coarsely powdered, and spread equally over its bottom to the depth of about half an inch The top of the pan is then covered with a diaphragm of bibulous paper, fitting closely over it by being pasted round its rim. The diaphragm may be pierced by a few small pin-holes, which greatly facilitates the sublimation. The pan is surmounted with a paper cap, twelve or eighteen inches high, fitted closely to its top, and fastened by means of a cord passed two or three times round it. The apparatus is to be cautiously heated for ten or twelve hours on a sand or, still better, on a metallic bath. The temperature is to be kept as nearly as possible at about 400° Fahr., though towards the end of the sublimation it may be raised a few degrees higher. The crystals of pyrogallic acid pass up through the bibulous paper, which absorbs the empyreumatic oil by which they are always accompanied. Should the heat have been carefully regulated, the crystals, which are either large scales or needles, are perfectly white; should they be slightly coloured, which sometimes happens, they may be easily purified by a second sublimation. This method possesses the great advantage that a pound or more of the extract can be operated on at once. The apparatus is extremely cheap; and as it is not liable to break, it may be used for any number of times. On one trial, 1380 grains of dried extract

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* From a paper read before the Chemical Society, November 1st, 1842.—*Philosophical Magazine.*

yielded 69 grains of perfectly pure crystals, and 74 grains, which were slightly coloured, in all 143 grains, or 10.3 per cent. Now as galls yield rather more than half of their weight of soluble matter, the quantity of pyrogallic acid obtainable from them, by this process, is very considerable. I think it right to mention, however, that on a previous trial, when the sublimation was not so carefully conducted, I did not obtain more than half this quantity.

COMPOSITION OF SPONGE.

BY DR. POSSELT.

Sponge heated from 180 to 200° undergoes no visible change, it loses its elasticity dependent on moisture, but retains its tenacity, so that it cannot be reduced to a powder. At a higher temperature, decomposition commences, without any sign of its becoming glutinous. This decomposition, which is marked by an unpleasant odour, is accompanied by the development of carbonate of ammonia and water. The residue is brittle, and is difficult to incinerate. On an average, it yields 3.5 per cent. of ashes, consisting of silica, phosphate of potash, sulphate of lime, and a small quantity of iodide of potassium. By boiling sponge in water, no alteration is effected. Alcohol and ether extract a small quantity of fat. Mineral acids have no action on sponge, except in rather a concentrated form. Strong sulphuric acid is blackened by it ; and if diluted with water, and ammonia be added, no precipitate is produced. The substance loses its elasticity, and is friable, but insoluble in water, and remains unchanged in colour. In nitric acid it is partially soluble, if digested in it for some time. The residue is a soft, slimy mass of a yellow colour, soluble in water ; on addition of ammonia, it swells and dissolves into a fluid of a bright yellow colour. In potash it is very soluble, producing a beautiful red colour. These solutions yield precipitates with tincture of galls, but not with ferrocyanate of potash, or bichloride of mercury. The nitric acid in which it has been dissolved, forms no precipitate on addition of ammonia. Boiled with nitric acid, it is readily decomposed with a development of gas. Muriatic acid in a concentrated form acts on sponge, if it be for some time in contact with it, producing neither in the solution nor the residue a blue colour, but dissolves it. The solution is not rendered turbid by ammonia, ferrocyanate of potash, nor bichloride of mercury. Boiled with muriatic acid, sponge assumes a brown colour, and is dissolved, forming a brown fluid. Acetic acid produces no change on it. Caustic ammonia has no action on sponge, but it is perfectly soluble in the fixed alkalies, with the development of ammonia, and the production of a yellow colour. By heating, the decomposition is promoted, and the fluid assumes a beautiful red colour, changing to brown if the boiling be continued ; the fluid then becomes viscid, and ammonia is generated in considerable quantity, with a very disagreeable odour. If the boiling be still continued, the generation of ammonia proceeds until all the nitrogen is exhausted. This solution, saturated with acid, yields a very trifling precipitate, and is rendered turbid. The carbonic acid which escapes, is accompanied by sulphuretted hydrogen, recognizable by the smell. Caustic barytes only acts upon sponge when heated, it then dissolves it, producing at first a red colour, forming ultimately a yellow fluid. For the elementary analysis, the sponge was treated with ether. and then with alcohol, and lastly, with dilute muriatic acid. After washing with water, it was cut into pieces, and dried at 100°. The quantity of ash was about 3.59 per cent. The analyses were made with chromate of lead ; to determine the quantity of nitrogen, the method of Will and Varrentrapp was followed.

Unchanged substance of Sponge.			Product of decomposition insoluble in alcohol.			Product of decomposition soluble in alcohol.
C=48.75	49.11	48.74=C_{48}	46.48	45.85	46.33=C_{48}	46.66=C_{48}
H= 6.35	6.25	6 27=H_{75}	6.40	6.44	6.17=H_{73}	6.34=H_{77}
N=16.4	15.9	16.40=N_{13}	14.81	14.81	14.81=N_{12}	5.81=N_5
O=28.50	28.74	28.59=O_{22}	32.31	32.90	32.69=O_{25}	41.19=O_{32}

The quantity of sulphur is uncertain and inconsiderable; but that it is always present, the generation of sulphuretted hydrogen, as above mentioned, demonstrates,; as also sulphur may be detected if sponge be treated with chlorine, and the solution tested. From these experiments it appears that sponge is a peculiar substance approximating to horn, but differing from it in composition. It is not a compound of proteine, of which it yields no traces.—*Annalen der Chemie und Pharmacie.*

ADULTERATION OF DRUGS.

CALOMEL.

The *Journal de Chimie Médicale* states, that M. Moritz, a German chemist, being commissioned to examine two specimens of calomel, one called *calomel prepared by steam*, the other, *calomel prepared by precipitation*, found the former to contain a fifth of its weight of sulphate of barytes; the latter was ammonio-chloride of mercury (white precipitate), mixed like the former with a fourth of its weight of sulphate of barytes.

LINSEED-MEAL.

The linseed-meal supplied to the Pharmaceutists and others who sell this article in France, has been found to be adulterated with the powder of a grain deprived of its mucilaginous principle by torrefaction, and from which the oil has been pressed, mixed frequently with bran, oatmeal, and almond powder, with the refuse of starch-manufactories, &c. To these a little oil is added; which, from its being often in a rancid state, renders the use of the powder for poultices very injurious.

REVIEWS.

A Treatise on Diet; *comprising the Natural History, Properties, Composition, Adulteration, and Uses of the Vegetables, Animals, Fishes, &c., used as Food.* By William Davidson, M.D., M.R.C.S.E., &c. pp. 383. *London, John Churchill; Glasgow, David Robertson; Edinburgh, A. and C. Black; and William Curry, jun., and Co., Dublin.*

The author adverts in his Preface to the number of works which have appeared on dietetics, but observes, that "there exists, however, no modern English work, in which alimentary substances are described individually as to their natural history, general properties, chemical constitution, adulterations, and uses, accompanied with an exposition of the principles of diet." The work is, therefore, interesting, not merely to the epicure or valetudinarian, but also to those who when they sit down to

dinner, may like to amuse themselves with speculations as to the nature, habits, history, and peculiarities of every animal or vegetable on the table. As all persons of education ought to be possessed of this kind of information, we have no doubt that the "many-headed" volume before us will be popular.

REMARKS ON MEDICAL REFORM, *in a Second Letter addressed to the Right Hon.* SIR JAMES GRAHAM, Bart. By SIR JAMES CLARK, M.D., F.R.S. 8vo, pp. 40. *London, John Murray, Albemarle Street.*

The chief object of this letter is to advocate a general improvement in the education and professional standing of the medical bodies, more especially the general practitioners, whom the author is desirous of rescuing from their present equivocal position as medical shopkeepers. We quote the following, which is the only passage in which our body is particularly interested :

"In thus advocating a liberal education for the General Practitioners, as the only means of insuring their respectability as a body and giving them a status in their profession, it must be evident to themselves that so desirable a change in their position cannot be effected until the dispensing of medicines ceases to be a part of their duty—until the practice of Pharmacy is separated from that of Medicine. In towns the separation may be effected without difficulty. In Edinburgh it may be said to be already accomplished. It is true that in villages and country districts the Practitioner would require to keep such medicines as were necessary for immediate use, more especially in the treatment of acute diseases. In such cases, however, the medicines ought not to form a separate charge, but be included in that for attendance, being considered in the same light as surgical instruments. But until the practice of Pharmacy is separated generally from that of Medicine, General Practitioners cannot attain that position in their profession nor hold that station in society which they ought."

These observations are so conclusive, that they require no comment. We noticed Sir James Clark's former letter in Vol. II., page 102, and should have gone further into the subject on the present occasion, if the author had given us the opportunity, by furnishing materials for discussion in reference to Pharmacy.

A LECTURE ON QUACK MEDICINES. By T. G. WRIGHT, M.D., Wakefield. 8vo pp. 44. *London: R. Groombridge, Paternoster Row; Simpkin and Marshall, Stationers' Court. Leeds: Baines and Newsome. Wakefield: Hurst; Stanfield and Palmer; Illingworth and Hicks..*

AFTER having given a concise history of the traditional origin and progress of Quackery, the author combats the superstitious prejudices which have always existed on the subject, and exposes the fallacy of the prevalent notions of "specifics" and "universal remedies." He next proceeds to classify the various quack

medicines into four classes: 1st. Those which, although sold as *secret* remedies, have been analysed and their properties ascertained (as for instance, James's powder); 2d. External applications; 3d. Internal remedies recommended for special disorders; 4th. Universal specifics. In conclusion, the author recommends an effectual remedy for quackery, which remedy may be considered an universal specific, but the prescription is so well expressed in the words of the author, that we refer our readers to the pamphlet for this important information.

THE SALE OF SPIRITS OF WINE.

We think it right again to caution our members against selling spirits of wine, except for medicinal purposes. We hope some redress will be obtained before long, but the Council has not yet succeeded in bringing the subject to a satisfactory issue. It is evident that the construction which is now acted upon is at variance with the original object of the act, which was, according to the terms of the preamble, to restrain "the drinking of spirituous liquors or strong waters." The sale of spirits for this purpose was never claimed as a prerogative of the Chemist; but as the law is now interpreted, we are not even allowed to sell the article for purposes connected with our own business except under very stringent limitations. A very slight alteration in the words of the act would remove the difficulty without giving rise to any abuse. The alteration which we would suggest is the insertion of the word *scientific* as well as *medicinal*. It cannot, we presume, be the intention of the legislature that the analytical Chemist should be obliged to resort to the gin-shop to obtain alcohol for his scientific researches, when it is well known that he is not likely to get a spirit from that source which would answer his purpose.

TO CORRESPONDENTS.

Verax remarks, that our observations on *price lists* are made with reference to the wholesale trade (Vol. II., No. 9, p. 562), and thinks they ought to have been extended to the retail. Verax gives several instances of *unjustifiably* low prices being quoted in shop-bills, and recommends the exposure of the parties in the Journal, as a mode of checking the practice. [We not unfrequently have occasion to notice delinquencies of this kind, but always avoid any personal allusion to individuals. We intend to advert to *retail competition* shortly.]

Mr. Robert Raw (Richmond) and A. P. S. (Berkley) recommend the publication of Price Lists periodically by the Council, as a means of bringing about some degree of uniformity in the charges both wholesale and retail. [This would be attended with more difficulty than our correspondents imagine, as we shall have occasion to explain when we go into the particulars of the subject.]

"A Druggist," (Whitehaven) complains of the inroads of Surgeons on the trade of Druggists, not only in dispensing prescriptions, but in the sale of drugs, filling medicine chests, &c. [We cannot insert any comments on this subject as a *party question*; the propriety of some judicious arrangement between the two classes has already been suggested, and we hope it will be put in practice.]

"A Retail Druggist" suggests the establishment of a depôt by the Society for supplying members with genuine chemicals, &c., a person or persons being employed to test the same. [We should be sorry to see the Pharmaceutical Society become a trading body. Those who are willing to pay for genuine articles can obtain them without much difficulty; it is the *demand* for such as are adulterated which occasions their circulation in the market.]

"An Associate in Town" alludes to the similarity between *Chinova bitter* and *Smilacine*, the former only differing from the latter in containing one additional equivalent of water, according to Dr. Turner. He also proposes the formation of a Latin Class at Bloomsbury Square. The latter suggestion should be addressed to the Council, not anonymously.

"A Member," Manchester.—We shall be glad to receive the information.

F. F., A.P.S.—We have never seen a recipe for "Nectar Powder." The List of Members and Associates is in Vol. II., No. 4.

"John, A.P.S."—1. Wanted a recipe for black varnish, or black compo, for polishing leather? 2. Wanted a book on symbols and equivalents, suitable to a beginner? [Any modern work on Chemistry]. 3. Are there any medicinal plants in bloom during the month of May in this country? [Very few.] 4. Is it true, as reported in the *Chemist*, that our members are leaving daily? [No.]

E. P.—We recommend Blaine's Veterinary Art.

M. P. S. (Kennington).—The formula for Donovan's Solution of Hydriodate of Arsenic and Mercury, is in Vol. I., page 426.

W. R. W. and A. P. S. (Portsea).—We should not recommend an apprentice who has served only half his time, to offer himself as a candidate for the Associates' examination. There can be no advantage in being plucked.

L. G.—The vehicle generally used for preserving roots, &c. in the moist state, at the museum of the Society, is rectified Spirit of Wine: dilute acetic acid has been used in some cases with success.

"Ignobilis."—The object of testing sulphate of potash with solution of sulphate of silver, as directed by Mr. Phillips in the Pharmacopœia, is to ascertain whether any chloride be present. Sulphate of silver is a sparingly soluble salt. With reference to equivalent numbers, *see* Vol. I., page 331.

"An Associate" (Newcastle).—New editions of the Pharmacopœia are not published at stated periods. A translation usually follows each edition, the translator being appointed by the College.

"An Associate" suggests the propriety, in preparing the Tinctura Rhei, of maceraing the rhubarb in the *water of the proof spirit* previously to the addition of the spirit and other ingredients.

J. Bowerbank. The strongest nitric acid, sp. gr. 1.5, fit for using in the galvanic battery alluded to, is sold by Messrs. Howard and Kent, of Stratford, and other wholesale houses. Platina wire may be obtained at Knight's, in Foster Lane; Dimond's, Holborn, &c. &c.

"W. B., A.P.S." There is no authorized formula for Tinctura Cormi Colchici; should such a tincture be ordered, the proportions given in the Pharmacopœia for Vinum Colchici, only substituting proof spirit for sherry, may be adopted.

"Omega." We recommend Dr. Roget's Treatise on Electricity and Galvanism, published by the Society for the Diffusion of Useful Knowledge; and Dr. Golding Bird's Work on Natural Philosophy.

H. Healy.—Probably the best method of preventing beer from becoming sour in hot weather, would be to adopt the Bavarian process of fermentation, a description of which will be found in this Journal, Vol. II., page 400.

N. M.—No. 1 appears to be a fair sample.

B. CHASTON. We publish an Index at the conclusion of each volume.

"OMICRON."—We know of no work devoted exclusively to the purpose mentioned. Such information is generally to be met with in modern works on Chemistry. For the preparation of chloride and oxide of silver, *see* page 724 of this number.

W. H. (Glasgow).—*See* Vol. I., No. 4, page 140, of this Journal.

W. SUNDERLAND.—The following is the formula for the "Mistura Creasoti" of the Edinburgh Pharmacopœia:—Take of Creasote, Acetic Acid, of each, M. xvj.; Compound Spirit of Juniper, Syrup, of each f ℥j; Water, f ℥xiv. Mix the Creasote with the Acid, add gradually the Water, and lastly, the Syrup and Spirit. The Acetic Acid ordered in this formula is the Glacial Acid of the Edinburgh College. This mixture is said to have been found useful for allaying sea-sickness.

"H. B. M." *Blue Ink* is made by dissolving Prussian Blue in an aqueous solution of Oxalic Acid. *Red Ink* is generally an infusion or decoction of Brazil Wood in Vinegar, thickened with Gum, and sometimes a little Alum.

W. N. T.—We know of no method of testing the genuineness of tobacco, excepting by its physical characters, or by examining it for the presence of the peculiar proximate principles of the plant. The unmanufactured leaf-tobacco should be used in medicine.

"AN ASSOCIATE," (Leominster).—Smith's Compendium.

W. C. I.—A formula for Tincture of Hybiscus Abelmoschus was published by Dr. Reece; we believe the proportions were 2oz. to 16oz. A Platinum Capsule is ordered in making Acidum Phosphoricum dilutum, P. L., because the acid is liable to act upon other materials at the high temperature required.

W. E. W.—Selecta è Prescriptis, price 5*s*.

"DELTA."—See the notice inside the cover of Vol. II., No. 9. The diploma will be issued to the founders as soon as the requisite number are printed and signed, and to the other members as soon as possible afterwards.

"INQUISITOR."—See the answer to Delta. We cannot notice any further remarks on the subscription, except upon STATISTICAL DATA. We have already proved by CALCULATION, that the amount cannot be reduced at present without altering the constitution of the Society. Frequent repetitions are fatiguing. See the leading article of our last number, and the passages referred to in a note, page 618. Inquisitor complains that the articles in the Journal are too scientific and not sufficiently practical. We hope to improve.

A. A. having attended lectures on Chemistry, wishes to know what further qualifications he requires in a situation as a brewer, a soap-boiler, or a sugar-refiner?—*Ans.* Practical experience.

"TIRO" inquires what course he ought to pursue in order to become acquainted with botany?—*Ans.* If in London, attend Dr. Thomson's lectures; if in the Country, study Nature, and Lindley's Elements.

"OBADIAH," being an Associate, is not liable to the fine for non-registration of his indentures, and need not pass the examination.

R. H.—State the case to Mr. Churchill.

MR. MASON complains that he has written more than once without receiving answers. We have sent him two letters by post. One of his questions is answered in this number.

B. V. W. S.—The PHARMACEUTICAL SOCIETY is a voluntary association, and could not be made compulsory without an Act of Parliament.

ERRATUM.—In our last number, page 667, line 6 from bottom, for *Synthetical*, read *Syntactical*.

Advertisements to be addressed to Mr. CHURCHILL, Princes Street, Soho.

Other Communications to THE EDITOR, 338, Oxford Street (before the 20th, if answers be desired in the ensuing number).

THE PHARMACEUTICAL JOURNAL.

VOL. II.—No. XII.—JUNE 1st, 1843.

TRANSACTIONS
OF
THE PHARMACEUTICAL SOCIETY.

LECTURE II.

ON THE POLARIZATION OF LIGHT, AND ITS USEFUL APPLICATIONS.

BY JONATHAN PEREIRA, M.D., F.R.S.

HONORARY MEMBER OF THE PHARMACEUTICAL SOCIETY.

3. COLOURED POLARIZATION.

When an excessively thin film of a doubly refracting crystal is placed in the polariscope, that is, between the *polarizing* and *analyzing* plates, the most gorgeous colour or colours appear, and when the analyzer is rotated on its axis they change to complementary tints. If the film be of uniform thickness, the colour is uniform; but if the film be of irregular thickness, different colours are perceived.

In order to produce colour, it is necessary to use, first, a *polarizer*, as a tourmaline, or a reflecting plate; secondly, a *film of a doubly refracting crystal*, called the *depolarizer;* and, thirdly, an *analyzer* or *test*, as a tourmaline, a reflecting plate, or a doubly refracting prism.

The office of the *polarizer* is indicated by its name; it polarizes the light. Without this no colour is perceived, for a reason which will be hereafter explained.

The *doubly refracting film*, called the *depolarizer*, receives the light thus polarized, and doubly refracts it. That is, a system of waves, constituting the incident ray, entering the crystalline film, is resolved into two systems of equal intensities within it. These form respectively the *ordinary* and *extraordinary* rays (fig. 14, *O* and *E*). They are polarized in planes +45° and —45° to that of the incident system, so that the plane of polarization of the ordinary system forms an angle of 90° with that of the extraordinary system.

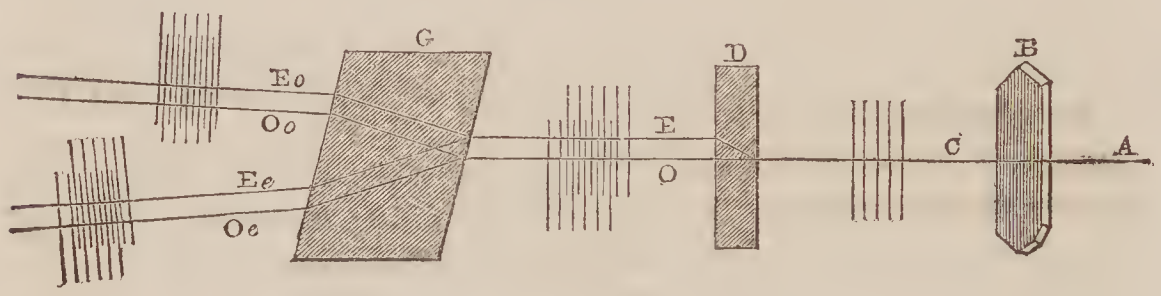
Now, the two systems of waves thus produced traverse the crystal in different directions and with different velocities; but as the film or plate is excessively thin, they emerge superposed. One set proceeds through the crystal more slowly than the other; or, in the language of a distinguished writer on this subject, one

set lags behind the other: so that at their emergence they are found to be in different phases of vibration.

By the *analyzer* each of the two systems (*O* and *E*) is resolved into two other systems (*Oo Oe* and *Ee Eo*), so that now four systems or two pairs are produced.

But the vibrations of these four systems are made in two planes: that is, two in one plane, and the other two in a second plane, which is rectangular to the first. Now, as the two vibrations which are made in the same plane, are not in the same phase (the one system having suffered a greater retardation than the other), the waves interfere and produce colour (if the incident light be white). But the two vibrations of the one plane *conspire*, while those of the other plane are *opposed*. Hence the tint or colour produced by the interference of the waves, in one plane, is complementary to that produced in the other plane. So that if the analyzer be a doubly refracting prism, both complementary colours are seen by transmission; but if it be a reflector, one is reflected and the other transmitted; whereas, if it be a tourmaline, one is transmitted, while the other is suppressed, extinguished, or stifled.

Fig. 14.



Production of Complementary Tints.

A. A ray of common or unpolarized light incident on *B*.
B. The polarizer (a plate of tourmaline).
C. A ray of plane polarized light incident on *D*.
D. The doubly refracting film or depolarizer.
E. The extraordinary ray } produced by the double refraction of the ray *C*.
O. The ordinary ray }
G. The analyzer (a doubly refracting prism).
Eo. The ordinary ray } produced by the double refraction of the extraordinary ray *E*.
Ee. The extraordinary ray }
Oo. The ordinary ray } produced by the double refraction of the ordinary ray *O*.
Oe. The extraordinary ray }

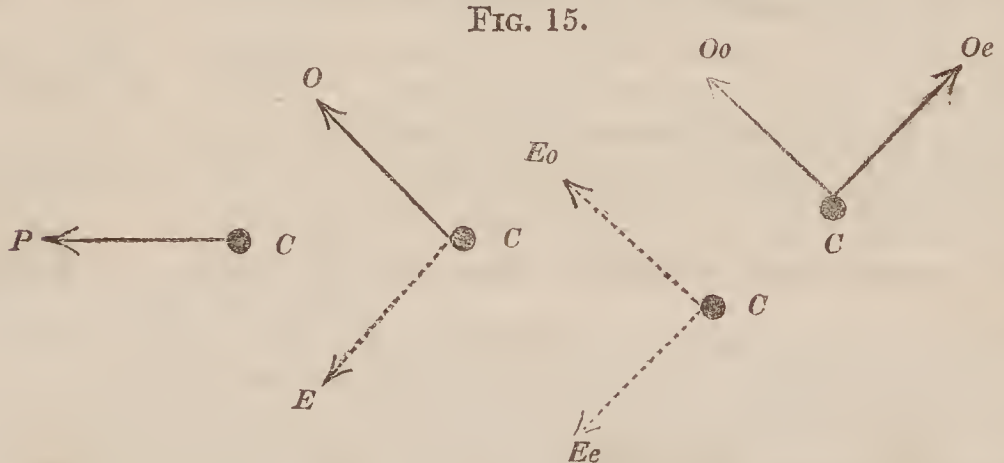
To render somewhat more intelligible the cause of the colours being complementary, and, therefore, to explain what is meant by the *conspiration* and *opposition* of vibrations, let us suppose the vibrations of the polarized light (*C*, fig. 14) to be made in the plane, *C P*, fig. 15; and to give more precision to our ideas, let us further suppose that the molecule *C* is, at a given instant, moving *from C* towards *P*.

The doubly refracting film resolves this motion into two other motions, performed at right angles to each other, one in the direction *C O*, the other in the direction *C E*. The waves pro-

duced by the vibrations in the plane *C O*, we shall suppose to constitute the *ordinary* system, while those in the plane *C E* form the *extraordinary* system. But the plate is much too thin to have produced between these two systems any sensible separation.

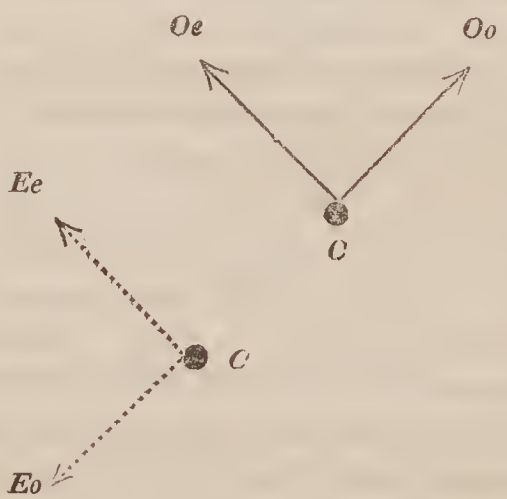
Each of these motions is resolved, by the analyzer, into two others at right angles to each other. That is, the vibration *C O* is resolved into the vibrations *C Oo* and *C Oe;* while the vibration *C E* is resolved into the vibrations *C Eo* and *C Ee*. Now, it is obvious, that the two motions *C Oo* and *C Eo* act in the same direction, or, in other words, they *conspire*, or *strengthen each other;* while the motions *C Oe* and *C Ee*, though performed in the same plane, *oppose* or *destroy* each other.

Fig. 15.



By rotating the analyzer the reverse happens: *C Oo* and *C Eo oppose* or *destroy* each other, while *C Oe* and *C Ee conspire*, or *strengthen each other*, as in fig. 16.

Fig. 16.



Thus, then, the original polarized ray (*C*, fig. 14) has been resolved into four rays, two polarized in one plane, and the other two polarized in a plane rectangular to this. The two rays which interfere and destroy each other, differ by half an undulation. The colour produced by the interference of the *conspiring* rays, corresponds to the difference of the routes of the two polarized rays in the plate or film, while that which results from the interference of the *opposing* rays, is that which is due to the same difference augmented or diminished by half an undulation. In the case

above noticed, in which *C O e* and *C E e* (fig. 15) are opposed, the colour corresponds to the difference *plus* half an undulation.

But it may be asked, What is the use of the polarizing plate? What is the reason that no colour is perceived if the light which is incident on the double refracting film be common or unpolarized? To explain this, let us suppose that a ray of common or unpolarized light consists of two rays rectangularly polarized. Each of these rays will suffer the same series of divisions, subdivisions, and interferences as the former; but the tints produced by the one ray will be complementary to those of the other; so that we shall thus obtain two pairs of complementary tints, and as the tints of each pair will emerge superposed, they will neutralize each other, and the resulting light will be of uniform whiteness.

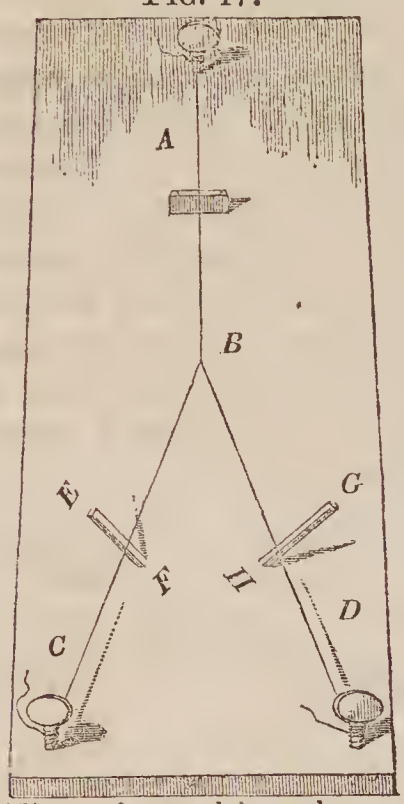
Thus,	1st pair of tints.		2d pair of tints.
Suppose the two complementary tints produced by one ray to be.....	Green	and	Red.
Those produced by the second ray will be	Red	"	Green.
And the sum of each pair will be	White.		White.

For red and green are complementary tints, and produce by their union white light, as I have already demonstrated.

The office of the doubly refracting film, called the depolarizer, is to doubly refract the polarized light. It prepares the rays for the changes which they have ultimately to undergo and by which colour is to be produced. The thickness of the film or crystalline plate determines the tint; but the actual thickness required to produce a given tint depends on the nature of the crystal. By this plate or film two rectangularly polarized systems of waves are produced, which traverse the plate in different directions and with different velocities, and emerge in different phases of vibration. Now as they are superposed, and as the retardation amounts only to a few undulations and parts of an undulation, it might be supposed that colour would be produced by their interference. But I have already stated that two rectangularly polarized rays do not interfere, so as to produce colour. In order, therefore, to make them interfere, their planes of polarization must be made to coincide; and to do this is the function of the analyzer.

In order to assist us in comprehending how a polarized ray may be resolved into two others polarized in different planes, we may take, as an illustration, a stretched cord, fig. 17 *A B*, dividing at *B* into *B C* and *B D*, making a small angle with each other at *B*, and having either equal or unequal tension. Let us suppose the extremity *A* of the single cord to be made to vibrate regularly in either a horizontal or vertical plane; now, by means of two polished guiding-planes, *E F* and *G H*, inclined at different

Fig. 17.



angles to the horizon, and making a right angle with each other, the horizontal vibrations of the cord *A B*, will give rise to two other vibrations, parallel respectively to *E F* and *G H*. And if we assume the two branches *B C* and *B D* to be unequally tense, the waves produced by the vibration of *A B* will be propagated along them with unequal velocity. So that this illustration, which I have adopted from Sir John Herschel's able treatise on light, serves to explain not only how a vibration in one plane may be resolved into vibrations in two other planes, but also why the two resulting waves are propagated with unequal velocity.

Though a thin plate of Iceland-spar or of any other doubly refracting crystal serves, when placed in the polariscope, for the production of colour; yet certain crystals are preferable to others on account of the facility with which they may be split into thin laminæ. Selenite and mica are especially convenient for this purpose; and the former of these is extensively employed by opticians in the preparation of a variety of beautiful and ingenious polariscope illustrations. On this account a brief notice of it is requisite.

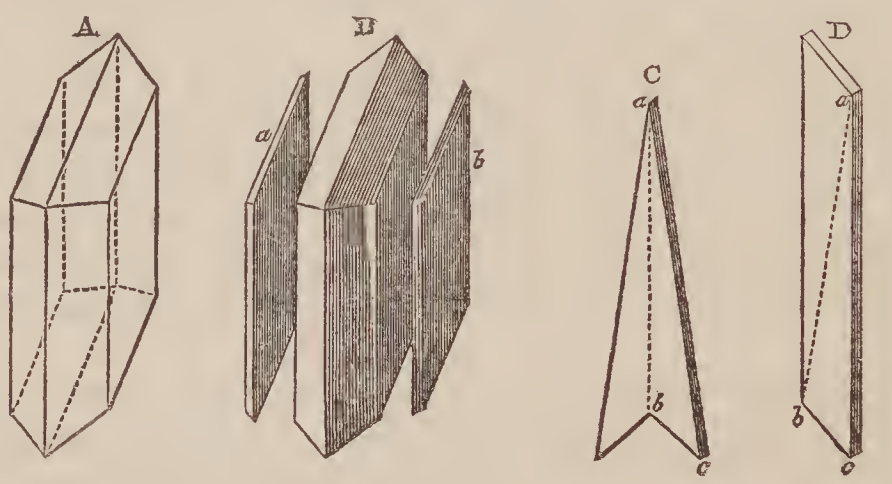
Selenite, or *sparry-gypsum*, is the *native crystallized hydrated sulphate of lime* (Ca O. S O_3 + 2 Aq.) It occurs imbedded in London clay. It is found also at Shotover Hill, near Oxford, where the labourers call it *quarry glass*, and likewise at the Isle of Sheppy. Very large crystals of it are found at Montmartre, near Paris. The crystalline forms in which it occurs belong to the oblique rectangular prismatic system. Haüy and the late Mr. William Phillips describe its primary form as a right oblique-angled prism; so that the lateral faces of the crystal are regarded by them as the terminal planes. But the optical characters of the crystal prove the incorrectness of the description of these celebrated mineralogists: and here, I would observe, is an excellent illustration of the great value of polarized light to the crystallographer. In this particular instance it enables him to distinguish a lateral face, from a terminal plane, of a prism.

The crystals of selenite which are most frequently met with, are oblique rectangular prisms, with ten rhomboidal faces, of which two are considerably larger than the others (fig. 18 *A*). They are very easily slit into thin laminæ (*a b*, fig. 18 *B*), parallel

to these larger lateral faces (terminal planes of Haüy and W. Phillips).

Macles or hemitrope crystals of selenite are very common. By hemitrope, a word derived from the Greek (from ἡμι *half*, and τρέπω *I turn*), is meant a figure produced by cutting the primary crystal in two, causing one of the fragments to make half a revolution, and then uniting the sides actually in contact. The most singular and common hemitrope variety of selenite is that called *arrow-headed selenite* (fig. 18 *C*), and which is so called because the crystal is formed like the barbed head of an arrow. Its nature may be easily explained. Cut a card or thin board in a rhomboidal form to represent one of the laminæ taken from lateral faces of the prism (fig. 18 *D*). Then divide it in the direction of its greater diagonal (*a b*), and transpose the separated parts in such a manner, that two of the alternate angles, produced by the diagonal division, shall make the point —the other two, the barbs—of the arrow-head.

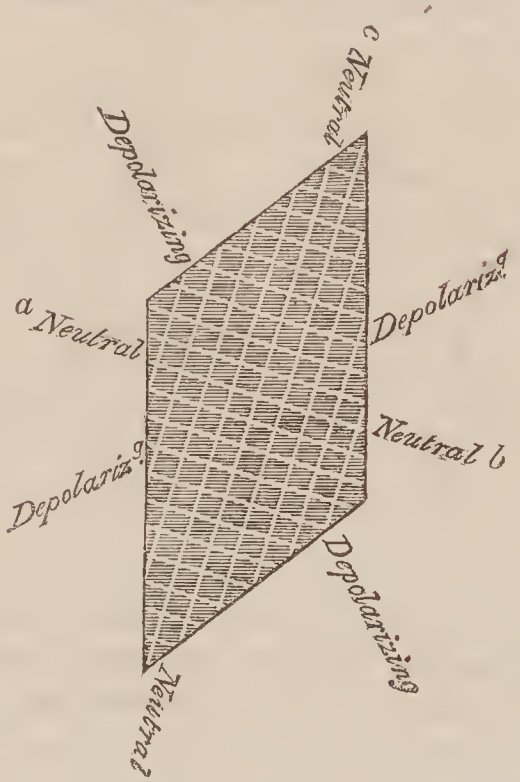
Fig. 18. *Selenite.*



The optical structure of films or thin plates of selenite, having a thickness of from $\frac{1}{20}$th to the $\frac{1}{60}$th of an inch, is very curious. In two rectangular directions they allow perpendical rays of polarized light to traverse them unchanged: these directions are called the *neutral axes*. In two other directions, however, which form respectively angles of 45° with the neutral axes, these films have the property of double refraction. These directions are usually denominated *depolarizing axes;* but they might be more correctly termed *doubly refracting axes*.

In order to render these properties more intelligible, suppose the structure of the film to be that represented by fig. 19, in which the film is seen to be crossed by two series of light lines, or passages, the one perpendicular to the other. These are to represent the *neutral axes*. We may imagine, that in these directions only can the ethereal molecules vibrate. A ray of incident polarized

FIG. 19. *Imaginary Structure of a Plate of Selenite.*

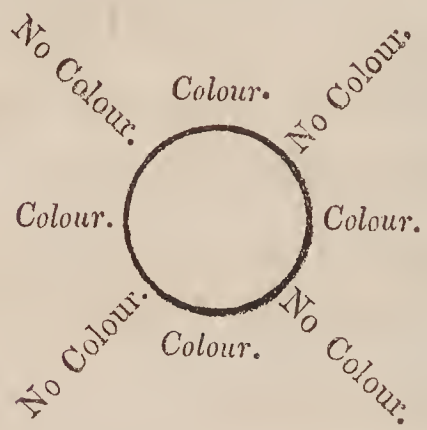


light whose vibrations coincide with either of these lines, is transmitted through the film unchanged. But a ray of incident polarized light whose vibrations form an angle of 45° with these lines, or, in other words, which coincide with the diagonals of the square spaces, suffers double refraction; that is, it is resolved into two vibrations, one parallel with *a b*, the other parallel with *c d*, and, therefore, the directions of the diagonals of the squares are called the *doubly refracting* or *depolarizing axes.* But the two resulting vibrations are not propagated, in these two rectangular directions, with equal velocity, the one suffering greater retardation than the other, so that the waves, at their emergence, are in different phases of vibration, though they do not interfere so as to produce colour, because their planes of vibration are rectangular. By the analyzer, however, their planes are made to coincide, and colour is produced; and on rotating the analyzer on its axis, the colour changes and becomes complementary.

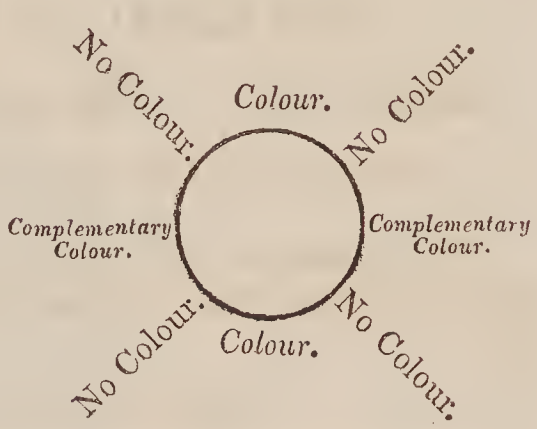
To illustrate these statements, place a film of selenite, of uniform thickness, in the polariscope. On rotating the film (the analyzer and polarizer remaining still), a brilliant colour is perceived at every quadrant of a circle, but in intermediate positions it vanishes altogether. We observe, however, that the tint does not change, but only varies in intensity. If, now, the film be fixed and the analyzer rotated, we also observe colour at every quadrant of a revolution; but the tint changes and becomes complementary at every quadrant—the same tint reappearing at every half revolution: so that when the film alone is revolved one colour only is

seen, but when the analyzer alone is revolved, two colours are seen.

Effect of revolving the film of Selenite.



Effect of revolving the Analyzer.



If we employ, as the analyzer, a double refracting prism, we observe two complementary disks of colour, and these may be made to cross and produce white light as before shown.

The thickness of the film of selenite determines the particular tint. If, therefore, we use a film of irregular thickness, different colours are presented by different thicknesses. A wedge-shaped piece will produce parallel bands of colours, and two wedges crossed present diagonal bands. A plano-concave film, as well as a plano-convex film, gives concentric rings of colour, the former with a black, the latter with a white, centre.

Two films superposed, do not give the colour which would arise from the mixture of the two colours, but either the colour which corresponds to the joint thickness of the films, or that which belongs to the difference of their thickness. When the two films are put together, as they lie in the crystal, the resulting colour depends on the *sum* of the thicknesses. But when the two films are crossed, so that similar lines in the one are at right angles to similar lines in the other, the resulting tint depends on the *difference* of the thicknesses. These facts admit of very beautiful, curious, and interesting illustrations. Thin films of selenite of uniform thickness are so arranged as to slide over figures also formed of films of selenite. The changes of colour effected in the tints are most striking, and to unphilosophical minds almost magical.

In the opticians' shops are met with a great variety of devices prepared with films of selenite of different thicknesses, and which constitute philosophical toys illustrative of the beforementioned facts. *Gothic windows*, *stars*, *flowers*, *fruits*, *animals* (butterflies, parrots, dolphins, and chameleons), and *theatrical figures* (Jim Crow, harlequin, &c.), are some of the ingenious, and often laughable illustrations contrived by Mr. Darker.

(*To be continued in our next.*)

SECOND ANNIVERSARY

OF THE

PHARMACEUTICAL SOCIETY,

Held at No. 17, *Bloomsbury Square, May* 16*th*, 1843.

WILLIAM ALLEN, F.R.S., PRESIDENT, IN THE CHAIR.

The Chairman, after having expressed the pleasure which he felt in meeting his brethren, called upon the Secretary to read the

REPORT OF THE COUNCIL.

In presenting to the Members the Second Annual Report, the Council think it right again to advert to the general objects of the Society, in order to point out the progress which has been made, and what still remains to be done.

The Society was established for the purpose of ameliorating the condition, and raising the character of those who practise Pharmacy in Great Britain. It is proposed to attain this end, first, by uniting all the Chemists and Druggists into one body; secondly, by introducing a system of pharmaceutical education; thirdly, by claiming for the body thus organized and educated, such protection and privileges as the qualification of the Members would entitle them to possess.

The first of these measures has been, to a considerable extent, carried into effect by the formation of a large and influential Association, which comprises within its ranks the leading members of the trade in the metropolis, as well as in most of the cities and towns in other parts of the empire. This union has been sanctioned and ratified by a Royal Charter of Incorporation, recently obtained and announced. The Association has ramified throughout the country, and in most of the provincial towns there are local secretaries. Thus the Pharmaceutists of this country are now recognised and represented; their affairs are conducted by a Council, annually elected by the Members; and although there still remain a considerable number who have not yet joined the Association, the Council trust that this number will gradually diminish, as the promulgation of the advantages of the institution induces fresh candidates to apply for admission.

The second of the above measures, which relates to education, has been progressing in like manner. A School of Pharmacy is established in London, and provincial schools have been projected by the Members resident in many large towns. The examination of candidates for admission has come into operation;

and thus the foundation is laid for raising up a more highly qualified class of Pharmaceutical Chemists than has hitherto been found in this country.

In order to attain to the full extent the protection and privileges above alluded to, as the third step in our proceedings, it is absolutely necessary to persevere with unabated zeal in the course which a rational view of the subject has pointed out, and the advantage of which has been proved by experience. It cannot be denied, that even during the short space of time that we have been united as a body, our prospects have become brighter — the disadvantages under which we formerly laboured have materially diminished, and our influence has increased in proportion.

FINANCIAL REPORT.

The first subject which it is the Council's duty to lay before the Society, is a Statement of the Funds.

RECEIPTS AND EXPENDITURE FROM MAY 1st TO DEC. 31st, 1842.

Dr.

	£	s.	d.
Balance in hand, May 1st, 1842	1026	9	7
* 3 Life Members	63	0	0
* 659 Members 1383 18 0			
Less 14, being Associates 14 14 0			
	1369	4	0
* 1337 Associates	1403	17	0
Subscriptions for 1841	15	15	0
4 Entrance Fees	21	0	0
6 Registration Fees, Apprentices	1	10	0
Fees for Admission to Lectures	100	5	6
Donation to Benevolent Fund	1	0	0
Interest on Stock in the Funds	138	7	2
Rent for Chambers and Attendance	35	4	0
Balance due to Treasurer 11 14 5			
Ditto Secretary .. 0 10 0			
	12	4	5
	£4187	16	8

Cr.

	£	s.	d.
Investment of Life Members' Subscriptions, 3 per Cent. Consols, Stock £316 11s. cost	294	0	0
Investment on account of Benevolent Fund, 3 per Cent. Consols, Stock £579 2s. 3d.	537	17	0
Cost of transferring Druggists' Old Fund to Society	0	13	6
Purchase of £1000 3½ Reduced	1006	5	0
Furniture	45	13	6
Museum	367	9	9
Library	52	6	6
Apparatus	59	0	6
Lecturers	100	15	10
Journals	1050	0	0
Delivery of ditto	28	10	3
Rent (Three Quarters)	180	0	0
Rates and Taxes	43	9	9
Secretary (Three Quarters)	112	10	0
Servants' Wages	77	5	6
Collector's Poundage	22	7	3
Postage	17	3	6
Stationery	16	14	9
Advertisements	22	13	6
Engraving, including Balance on account of Diploma, and Printing	117	0	0
Sundries	30	15	7
Subscriptions returned	5	5	0
	£4187	16	8

We, the undersigned Auditors, have examined the Accounts of the PHARMACEUTICAL SOCIETY, and find them correct, agreeably with the fore-

* The above members, added to those who joined the Society previous to the 1st of May, 1842, make altogether

17 Life Members.
1641 Members.
2313 Associates.

going Statement; and that there was standing in the names of the Trustees of the Society, at the Bank of England, on the 31st December, 1842.

		£	s.	d.
On Account of General Fund.....	3½ per Cent. Reduced ...	4000	0	0
Druggists' Old Fund	3½ per Cent. Consols.....	825	0	0
Life Subscriptions ...	3 per Cent. Consols	316	11	0
Benevolent Fund ...	3 per Cent. Consols	579	2	3

(Signed) *April* 20, 1843.

CHARLES COLIN LUCKOMBE.
EDWARD SIMKIN.
RICHARD HULSE.
WILLIAM WILKINSON.

The above statement, it will be seen, comprises the receipts and expenditure of the last eight months of the year, the Council, at the last annual meeting, thinking it would be satisfactory to make up the accounts to that time. In future, it is intended to present the account from January to December inclusive. It is also necessary to state, that at the close of last year the Society was under engagements to the amount of about £840, not included in the above account, and that the expenses attending the Charter of Incorporation, amounting to upwards of £600, are an item in the expenditure of the present year. On reference to the balance-sheet, in conjunction with the latter remarks, it will be observed that the calculation made by the Treasurer at the last meeting was within the amount which it has been found necessary to expend; and as it certainly has not occurred to many persons how large some of the items are which the magnitude of the Society renders indispensable, and the variety of demands which different objects make upon its funds, the Council would solicit the attention of Members to the whole statement, upon which they will be most happy to furnish any explanation that may be required.

The subject of the Annual Subscription has again engaged the attention of the Council, during the consideration of the Bye-Laws. The Council do not think it necessary to recapitulate the arguments which have been so often stated, but they still adhere to their original opinion, after another year's experience, and are satisfied that all the comprehensive objects of the Society cannot possibly be carried out, if any modification beyond that which the Bye-Law Committee have suggested, be at the present time insisted on, particularly in the prospect of very considerable expense being incurred in watching the progress and provisions of the forthcoming Medical Bill.

The Council are very anxious to impress upon the Members the absolute necessity of laying aside some permanent capital in a Society like this: unless that be done, there is no security against contingencies which may occur—there is no reserve on which to fall back in case of emergency, nor any means available for the extension or permanence of the Institution, if, as

its prosperity continues, it may be found desirable to make the Investment which the provisions of the Charter allow.

Another important subject connected with this part of the Report, is the

BENEVOLENT FUND.

The Council have not yet made any especial exertions on behalf of this fund—a part of its plan which the Council are persuaded has not been so duly considered and appreciated as its importance demands. Members should recollect that it is for this purpose that a considerable portion of the subscription will eventually be required; and as the benefits of the fund are to be extended to the Associates, whose contribution can scarcely be made available for this object, it is difficult to conceive how a provision is to be made for the relief of those who by reason of age, infirmity, or misfortune, require its aid, unless the funds of the Society are adequate to the means of administering it. Indeed, to do this effectually, or rather to create a fund sufficiently ample to enable the Council to commence an early distribution, the assistance derivable from the present amount of subscription will not suffice, and the Council deem the present a favourable opportunity of commemorating the possession of the CHARTER OF INCORPORATION, by soliciting especial and liberal donations to the Benevolent Fund. They also recommend that the sum of £500 be voted from the general funds at the present meeting, and regret that they do not feel justified in proposing a larger vote.

The Council would, in the next place, lay before the Members those subjects which have reference to the education which the Society has endeavoured to introduce among Chemists and Druggists; and first, with respect to the progress of

THE SCHOOL OF PHARMACY.

The Course of Lectures delivered at the Society's house on Botany, during the summer of last year, and the courses on Chemistry, Materia Medica, and Pharmacy, during the autumn of last, and the winter of the present year, have been as numerously attended as could, perhaps, have been anticipated. Forty pupils were entered to the Botanical Course, seventy-one to the Course on Chemistry, and seventy-nine to the Courses on Materia Medica and Pharmacy; and the Lecturers have reported their entire satisfaction at the regularity and attention of the Students, many of whom came from long distances.

The Council have now determined upon an extension of the instruction to be imparted in the ensuing seasons, and have made arrangements for the delivery of forty Lectures on Botany, by Dr. Thomson, during the summer; and of fifty Lectures on

Chemistry, fifty on Materia Medica, and twenty-five on Pharmacy, during the autumn and winter. The time necessary for this purpose, will be increased to three days a week in summer, and four days in the autumn and winter, so that the Council hope that the plan of instruction will thus become gradually enlarged, until it shall be fully adequate to the illustration of the important subjects which ought to form the professional education of the Chemist and Druggist, and the Trade will by degrees become accustomed so to accommodate the arrangements of business, as to afford the younger members of their establishments the opportunities necessary for participating in the advantages thus provided.

The Council would, in an especial manner, wish to impress upon the minds of the Members generally, the duty and necessity of urging the attendance of their Apprentices at the lectures given at the Institution, as it is to the rising generation, mainly, that the benefit is likely to accrue.

The Council have not yet been able to fit up a laboratory, in consequence of the difficulty of doing so at the Society's present house, and it will require much consideration before this essential undertaking is accomplished.

While thus reporting to the members the progress of the Metropolitan School, the Council are desirous of assuring the country members, that the establishment of provincial schools, and the extension of means for facilitating education throughout the country, locally, has by no means been lost sight of. Some steps have been taken in Bristol and Manchester for this purpose, and the Council hail, with sincere pleasure, the anxiety expressed from other quarters for aid towards this object. Hitherto, however, it really has not been in the power of the Council to give that undivided attention to the subject which its importance demands, and even if they had been prepared with a complete plan, they could not with propriety, or even common prudence, commence operations while the proposition for reducing the amount of subscription was in agitation. It is evident that the Provincial Schools of Pharmacy must be assisted, in the first instance at all events, with grants of money, and it is equally obvious that such grants could not be made in the event of the supplies being diminished.

EXAMINATIONS.

The Council report that this important branch of the Society's operations has been commenced, with reference to Associates and Apprentices, several of whom have passed creditably. The Board of Examiners has adopted a plan of proceeding which is calculated fairly to test the qualifications of the candidates, while

due allowance is made for the circumstances under which they present themselves at this early stage of the Institution, before the educational measures in progress could be expected to have produced their full effect.

DIPLOMA.

The completion of the DIPLOMA was delayed until the Royal Charter of Incorporation had been obtained, in order that the Society might be designated thereon as an Incorporated Body. The printing of the impressions is now rapidly advancing, and as soon as the number requisite is signed and properly filled up, due notice will be given for their delivery.

LIBRARY AND MUSEUM.

These essential parts of the Institution have, during the past year, made considerable progress.

The LIBRARY contains 746 volumes; 570 of which have been presented to the Society, including about 100 Pharmacopœias and Dispensatories. The Society also possesses complete series of some valuable Journals and Transactions of Scientific Societies, and numerous standard works on Pharmacy, and its collateral branches of science.

The MUSEUM has also been much extended, and contains about 850 specimens of Materia Medica, and its preparations; 510 of these specimens are donations to the Society — they altogether comprise a complete series of the Materia Medica of the London Pharmacopœia, and many very rare and curious specimens both of home and foreign production and preparation.

During the ensuing year, the Council hope it will be found practicable to bring the Museum to a greater degree of perfection, by the addition of many articles which it is necessary to possess; but the Council have thought it prudent not to make too large or rapid an outlay, that time might be given for the presentation of such specimens as the kindness and opportunities of friends might dispose and enable them to make. The same remarks will apply to the Library, which will necessarily be enlarged from year to year, in this age of rapidly-advancing information in Pharmacy, as well as every other art and science.

The Council are happy to report a very satisfactory attendance of visitors, particularly of the younger members of the Society, who seem anxious to avail themselves of the advantages thus brought within their reach.

Although it has not been found as yet practicable to fit up a laboratory, the Council have purchased some useful and valuable apparatus for illustration by the lecturers, which is arranged in a room specially fitted up for the purpose; this will be gradually

increased so as to put the Society in possession of such a complete assortment as will be creditable to a Philosophical Institution.

EVENING MEETINGS AND LECTURES.

These meetings continue to keep up their interest and the mutual intercourse of the Members of the Society which it is so desirable to encourage, and the Council trust that the matter which has been brought forward, and the subjects which have been selected for the lectures, have been found practically useful to the Members and Associates generally. The Council strongly urge upon all connected with the Society, the propriety of furnishing, themselves or by their friends, papers for reading and discussion, and of giving their personal attendance; and trust the Provincial Towns will not neglect so useful a plan of bringing their Members together for mutual instruction and good-will.

TRANSACTIONS.

Experience has tended to confirm the opinion of the Council that the periodical publication of Transactions is essential to the welfare of the Society, and conducive to the improvement and advantage of those for whom it is instituted. The existence of a regular organ of communication, devoted exclusively to the scientific pursuits, and professional concerns of the Pharmaceutical Chemist, is calculated to keep alive an interest in the well being of our body, and to promote harmony and good feeling among our Members individually. The Transactions of the Society continue to be published in the PHARMACEUTICAL JOURNAL, which is circulated gratuitously to Members and Associates, and to which many of our most eminent professors of Pharmacy and Chemistry are contributors.

BYE-LAWS.

As the Charter of Incorporation, recently granted to the Society, compels the Council to frame new Bye-Laws, in accordance with the principles of the Charter, and as this matter requires serious deliberation and much attention, it has not been at present possible so to complete them, as to enable the Council to lay them generally before the Members; they have, however, been received by the Council from the Committee appointed to frame them, and it will remain for the next Council to perfect their labours, and submit the Bye-Laws to legal authority, for sanction, before they come into operation.

GENERAL REMARKS.

The Council have not been unmindful of their obligations to watch any proceedings affecting the interests of the trade, and to exert themselves for its protection.

As soon as information reached them that the Board of Excise

had prosecuted some Members of the Society for the sale of spirits of wine, a deputation was appointed, which obtained an interview with the Chairman of that Board; and from what then took place, had reason to believe that the penalties inflicted would have been merely nominal. This not being the case, a memorial, stating at some length the peculiar position of the Chemist and Druggist with respect to the sale of spirits of wine, has been presented to the Treasury, and is now under its consideration.

About the same time the Council received intimation, that in consequence of similar informations being laid against some Druggists in Aberdeen, a memorial had been presented to the Secretary of State for the Home Department from that place, by whom it was transmitted to the Treasury.

The Council feel it right to state to the Members, that this is a subject upon which the government must feel great difficulty in legislating; and whatever may be the result of this important question, the Council must inform the trade that it is evidently the determination of the Board of Excise at present, and until some alteration may take place in the law, to enforce the sanctions of the Acts of Parliament very stringently.

There is another subject which has been introduced to the notice of the Council by the Members in several influential towns in the country, namely, the sale of drugs by grocers, oilmen, and other persons who have no pretensions to pharmaceutical qualification. In approaching this very difficult and at the same time important subject, the Council are fully impressed with the necessity of the utmost prudence and discretion. The necessity of education in all compounders of medicine being generally admitted, and the constitution and plans of the Pharmaceutical Society being calculated to furnish our own Members with those opportunities of improvement which have hitherto been wanting, the natural and inevitable result of perseverance in the measures now in progress will be the establishment of a distinction between competent and incompetent vendors of drugs.

It is generally known that the Secretary of State is preparing a Medical Bill, which is expected shortly to come before Parliament, on which occasion it will be the duty of the Council of the Pharmaceutical Society to watch the progress of that measure, and carefully to examine and consider such clauses as may directly or indirectly affect our body. There is no time in which unity among ourselves and stedfastness in our course are more essential than when the subject of medical legislation is before the Houses of Parliament. Unless we embrace this opportunity of protecting our interests and making the experience we possess in our own department, available for the good of the public, we cannot expect others to espouse our cause, or to enter into the de-

tails of what is almost exclusively our department, in a manner which would be likely to be satisfactory or creditable to us. On this account, the Council think it right to conclude their report by an appeal to all their brethren for that support and co-operation, which, at the present crisis, is of such paramount importance to the interests and character of our own branch of the Profession.

Mr. HULSE, in moving the first resolution, observed, that the Report was very complete and satisfactory; it embraced all the objects of the Society, and those particulars on which the Members would be most anxious to obtain information. It was indeed so very explicit, that he thought it unnecessary to enlarge upon it, but had much pleasure in moving, "That the Report be received and printed in the Transactions of the Society."

Mr. DAVIES, of Chester, seconded the resolution, which was carried unanimously.

Mr. JOHN BELL was very glad to see such a Society as this flourishing, which was established for individual as well as collective benefit. As no one could foresee the events which might befall him, or the casualties which might occur, he thought it seemed right that while we are in a condition to afford it, we should make some provision for the necessities of those whom misfortune or sickness had reduced to want. He therefore moved, "That the sum of £500 be invested in the names of the Trustees to the Benevolent Fund."

Mr. DANIEL BELL HANBURY seconded the resolution, which was carried unanimously.

Mr. PAYNE considered the present a suitable time to advert to the appeal contained in the Report of the Council for Subscriptions to the Benevolent Fund, and had much pleasure in laying before the meeting a list of donations, which the Council had just commenced, by way of example.

Mr. PAYNE having read the list,

Mr. MORSON rose to express a hope that this appeal would be responded to generally by Members throughout the country; at the same time, it ought to be understood that the amounts on the list need not be a standard for others, as a donation of half a guinea, or even less, might in many cases be quite as much as could be expected, and would satisfactorily evince the interest felt by the parties in the object contemplated. He considered it was in fact our duty to come forward as a body on this occasion, as all other professional or mercantile bodies had done. Indeed, the Chemists had for many years stood alone in this respect. He therefore hoped that we should no longer remain an exception, but that we should, at a period not very distant, bring the Benevolent Fund into practical operation.

Several Members desired to have their names added to the list, but it was thought better not to take up the time of the Meeting unnecessarily with that business; and Mr. Payne suggested that as the donations were altogether voluntary, it might be better for those who felt disposed, to come to the table at the close of the meeting, and contribute any sum they might think proper.

Mr. HALLOWS congratulated the President and Members assembled on the onward progress and cheering prospects of the PHARMACEUTICAL SOCIETY. It had been well said, that "greatness ever springs from low beginnings;" and so it might be truly said with regard to this institution; indeed, he thought, Mr. Farmar little contemplated the results that would follow, when he called the attention of his brethren to Mr. Hawes's Bill. "The seed then sown," continued Mr. Hallows, "has already grown into a royal plant, destined, I doubt not, to become a stately tree, under whose sheltering arms. and from whose verdant branches, the sons of Pharmacy will gather many a leaf for the healing of suffering humanity.

"Yes, Sir, ours is a noble and a useful art. It ought—it will—it must have its proper standing in this country. The anxiety of man for health has caused him to search in every quarter for articles of Materia Medica; and who can wonder at his exertion when we consider that *life* is the mighty prize for which he seeks. Well has the poet Blair described his industry, when he says,

> "'Nor hill, nor vale, as far as ship could go,
> Nor margin of the gravel-bottom'd brook,
> Escaped thy rifling hands; from stubborn shrubs
> Thou wrung'st their shy retiring virtues out,
> And vex'd them in the fire; nor fly, nor insect,
> Nor writhy snake, escap'd thy deep research.'

"All nature, Sir, has been laid tributary. Has the search ceased? Oh, no! let Dr. Pereira's two thick volumes bear witness that it has not. Let the elaborate and recondite exertions of the French and Germans, and their useful discoveries in the vegetable kingdom, proclaim that it has not.

"The search not having ceased, assuredly we must let the profession know that we have the 'right of search,' and cultivate, by every means in our power, the art which we profess. It may not, indeed, fall to the lot of all of us to follow our science with a youthful intensity, but we can all do something. Each may, and each should do his duty—and a serious and responsible duty it is! Each should act up to the full meaning of those statements frequently made, 'Prescriptions accurately prepared. The drugs are selected, and the chemical and medical preparations are conformable to the regulations of the Pharmacopœia.'

"Every apprentice and assistant should use his best exer-

tions, and every master should take care that those under his influence have every opportunity of improvement. And here, Sir, I would congratulate you on the establishment of lectures—a most delightful means of receiving instruction. I do trust they will continue to meet with encouragement. It was my good fortune to attend those delivered last season by Dr. Thomson, and our brother (for so I must call him), Mr. Redwood. Many useful things I learnt from the Doctor, but Mr. Redwood seemed to come into the shop with me, and say, such is the best way of doing this or that. I regret I cannot propose to myself the profitable pleasure of hearing the extended courses of these gentlemen, but I have thought it right to send my apprentice, agreeing entirely with the Report in thinking that our future success depends on the education of our younger members. Lectures, therefore, I consider of more consequence to them than those of my own standing.

"I admire, Sir, the steady course the Council have pursued, unlike the rash and hasty manner of some who would have their nostrum swallowed, without allowing time to read the bill of directions.

"To the Editor of the Journal I tender my best thanks. Our worthy Treasurer well deserves the most thankful mention: and the kindness, urbanity, and zeal with which my friend, the Vice-president, acts on all occasions, needs only to be named to ensure your warmest thanks.

"But now, Sir, I turn to you. It has, Sir, been your happy lot to be associated with some of the most eminent philanthropists of the age, in striking off the fetters of the poor African, and well have you merited the noble reward of your generous exertions. You are now, Sir, engaged in the endeavour to remove the mental slavery of a large and respectable class of your fellow-countrymen. May your attempt be as successful in *this* instance as it was in *that!* We are deeply thankful to you for allowing yourself to be placed at the head of the Pharmaceutical Society. May it please the Disposer of all human events to prolong your years, so that you may live to see this Society firmly established, prosperous, and useful! and at the last, when removed from us,

> "'May your sun of life go down,
> Like evening in the eastern clime,
> Which never knows a frown!'"

Mr. Hallows, in conclusion, had much pleasure in moving,

"That the Thanks of this Meeting be given to the Council and Officers of the Society, both in town and country, for their services during the past year."

Mr. Shum (of Bath) seconded the resolution. He had but little to add to what had been so well expressed by Mr. Hallows. Speaking on behalf of the Country Members, he believed that

the prevailing sentiment was that of gratitude to the Council for their exertions, and satisfaction at the result. He could inform the meeting that the offices of the Country Secretaries were more onerous than the Members in London might probably suppose.

The resolution was unanimously carried.

The Chairman acknowledged the vote of thanks, and stated that as long as his health was spared, it would afford him great pleasure to promote the interests of the Institution.

Mr. PAYNE stated, that as there was no further business to engage the attention of the meeting, except the election of officers, the present was the time for any Member to make any remarks which he might wish to offer to the meeting.

Mr. TOSSWILL having observed in the list of candidates for the Council, the names of several members at a considerable distance from London, wished to know whether any provision had been made for defraying their travelling expenses, and whether it was expected that they should attend every meeting of the Council? He suggested that the expenses ought to be paid, and thought it would be sufficient for the Country Members to attend once a quarter—on which occasions the most important business of the Society might be transacted; or, in the event of any special matter requiring their attendance oftener, they might be summoned. He thought it unnecessary for them to attend once a month.

Mr. PAYNE, in reply, stated, that the Council were particularly anxious for the constitution of the Society to be truly representative; and on this account they had prepared a bye-law, providing for the election of a certain number of Country Members on the Council, and for the payment of their travelling expenses. At the same time, the Council were sensible of the necessity of retaining a sufficient number of Members, resident in London, to transact the business of the Society, a considerable portion of which devolved upon the committees. In addition to the Country Members, of whom they thought three might probably be sufficient, the Council proposed that there should be on the list at least four wholesale Druggists, two of whom travel throughout the country. By this means the sentiments and wishes of the Society at large might be correctly ascertained.

Mr. DAVIES (of Chester) was glad to find that this subject had engaged the attention of the Council: he thought nothing was more calculated to secure the continued confidence of the Country Members than the course which had been adopted by the Council.

Mr. SPENCER thought the explanation which Mr. Payne had given, with reference to the appointment of Members resident in the country, was so satisfactory, that the only source of regret

was the necessity of displacing some of the present Council in order to make room for the new candidates.

Mr. Dodman (of Thorney) objected to the appointment of Members of Council residing at a distance from London. He spoke as a Country Member, and could assure the meeting that he had full confidence in the Council as hitherto constituted, and thought the proposed alteration involved unnecessary expense.

Mr. Ede (of Dorking) differed from the last speaker. He thought the Members in London were imperfectly acquainted with the kind of business done in some parts of the country; for which reason he advocated the mode of representation proposed by the Council. He enquired, whether the Council had ascertained Sir James Graham's intentions, in reference to the regulations of the trade? and whether he intended imposing any restrictions as to the articles sold by Druggists? He stated that in many places the Druggists could not gain a subsistence by the sale of drugs alone; but it did not follow that they were incompetent to sell drugs because they sold grocery or other articles.

Mr. Payne did not think it likely that the government would do more than require a proper qualification in those who acted as Chemists and Druggists.

Mr. McCulloch wished to know, whether the Society possessed the power of compelling those who ceased to be Members to return the diploma, as he was acquainted with several who intended, as soon as they had obtained it, to discontinue their support.

Mr. Payne stated, that a bye-law had been prepared to provide for such cases. He would also mention, that a short time ago, a person, not a member, had represented himself as a mamber on his labels and shop-bills, which fact being reported to the Council, the Solicitor of the Society was instructed to inform him, that legal proceedings would immediately be commenced against him unless he discontinued the practice. This communication produced the desired effect, and he subsequently wrote to enquire on what terms he could be admitted as a Member. — Mr. Payne appealed to the Solicitor for a confirmation of his statement, respecting the legal powers possessed by the Society of proceeding against any persons who might presume to retain unlawfully, or to imitate the diploma, or in any way falsely to represent themselves as Members.

Mr. Alderman Thomas Wood (the solicitor) fully confirmed Mr. Payne's remarks, stating, that the law was perfectly clear on the point, especially in the case of a Corporate Body.

Mr. Thomas Herring, reverting to the former subject, advocated the appointment of Country Members on the Council, as questions often arose in which it was desirable to obtain the opinion of Members at a distance.

Mr. Macfarlane (of Edinburgh) being called upon by

Mr. McCulloch to address the meeting, on behalf of the Members in Scotland, observed, that the only subject on which he had any remark to make, was that to which Mr. Herring had just alluded. He was sensible of the advantages of representation, but thought it unnecessary to delegate Members personally to attend the Council. The opinions or wishes of the Country Members might be sent by letter, which would cost only a penny, but it would cost more than a pound to send a man;—in most cases several pounds. He considered that the business of the Society had been hitherto satisfactorily conducted, and he believed this feeling prevailed among all those with whom he was acquainted.

The Chairman then called upon the meeting for any further remarks, which appeal not being responded to, the ballot was opened for the election of Council and Auditors. The following Members were appointed as Scrutineers: Mr. MACFARLANE (Edinburgh); Mr. GALE; Mr. TOSSWILL; Mr. JOHN BELL; Mr. BEST; Mr. BIRD; Mr. PEDLER; Mr. DODMAN (of Thorney); and Mr. HULSE.

The Ballot and Scrutiny occupied above three hours, after which time, the President having left the meeting, the Vice-president took the Chair, and the following Members were declared to be duly elected:—

COUNCIL.

ALLEN, WILLIAM, F.R.S., Plough Court.
BELL, JACOB, 338, Oxford Street.
BUTLER, THOMAS, 4, Cheapside.
DAVY, CHARLES, 100, Upper Thames Street.
FARMAR, ROBERT A., 40, Westminster Road.
FOULGER, SAMUEL, 133, Ratcliffe Highway.
GIFFORD, JOSEPH, 104, Strand.
GLAISYER, THOMAS, 12, North Street, BRIGHTON.
HANBURY, DANIEL BELL, Plough Court, Lombard Street.
HERRING, THOMAS, 40, Aldersgate Street.
HORNER, EDWARD, 20, Bucklersbury
HUDSON, W. BANKS, 27, Haymarket.
INCE, WILLIAM, 31, Southampton Street, Covent Garden.
LESCHER, JOSEPH SIDNEY, 60, Bartholomew Close.
MORSON, THOMAS, 19, Southampton Row.
PAYNE, CHARLES JAMES, 5, St. Martin's Court.
PIGEON, RICHARD HOTHAM, 31, Throgmorton Street.
SAVORY, JOHN, 143, Bond Street.
SQUIRE, PETER, 277, Oxford Street.
WAUGH, GEORGE, 177, Regent Street.
WOOLLEY, JAMES, 58, King Street, MANCHESTER.

AUDITORS.

COLK, GEORGE, 29, Fleet Street.
HUSKISSON, JOHN, 12, Swinton Street, Gray's Inn Road.
WATTS, JOHN, Edgeware Road.
WILKINSON, WILLIAM, 248, Strand.
WINSTANLEY, JUN., EDWARD, 7, Poultry.

Moved by Mr. MORSON, seconded by Mr. JACOB BELL,
"That the thanks of the meeting be given to the Scrutineers."

The resolution having been unanimously carried, the Chairman adjourned the meeting.

INTRODUCTORY LECTURE

TO A COURSE ON

MEDICAL AND GENERAL BOTANY.

BY A. T. THOMSON, M.D., F.L.S.
Honorary Member of the Pharmaceutical Society.

Delivered at 17, *Bloomsbury Square, on Wednesday Evening, the* 10*th May.*

Gentlemen,

If any additional evidence were required to demonstrate the earnestness with which this Society pursues the accomplishment of the great objects for which it has been instituted, it would be found in the continuation of the Course of Lectures commenced last year, upon a more enlarged, liberal, and complete scale. I feel flattered in being again selected to deliver the Course on Botany, and I must express my sense of gratitude for having the number of lectures doubled, as it enables me to do that justice to the subject, which could scarcely have been expected within the narrow bounds to which my efforts were, last summer, confined.

To those who are about to become my auditors, I am desirous to address a few words with respect to the advantages to be derived from the study of this branch of Natural History, in a scientific as well as a practical point of view. But before we proceed, let us understand what the subject is. What is Botany?

Botany is that branch of Natural History which has reference to the *external* or *physical characters*, and the *internal structure* of plants, their *vital actions*, and their *classification*. This definition is not too comprehensive, for without the knowledge of the structure, and the functions of plants, as organic beings, however useful *descriptive* and *systematic* botany might be, in recognising plants and distinguishing them from one another, still the investigation of the functions which their various organs are destined to perform, and the influence of external agents on the vital principle which they possess in common with animals are essential, and Botany, without these, would have little claim to the rank of a science.

Regarding Botany in a scientific point of view, it is almost of modern origin. I make this remark without hesitation; for, from the time of Hedwig to the present period, we owe all our knowledge of minute vegetable structure to the improvements in the microscope, and the mode of using it. Before the period to which I have alluded, although some progress had been made in vegetable physiology, yet Botany could not be regarded otherwise than that branch of natural history, which comprehends the external characters of plants, and the means of distinguishing them from one another; or, in other words, *Phytography*, or *De-*

scriptive Botany; and *Classification*, or *Systematic Botany*. The utility of these departments cannot be denied; and one of the objects of this course is to teach, through them, the mode of distinguishing and classifying *officinal* plants. But to confine my instructions to these objects alone, important as they are to the business of life, would be a dereliction of the trust reposed in me by this Society, whose views are not so much directed to the enrichment of those who are to succeed them in their useful and meritorious labours, as to elevate the minds of their pupils; and by so doing to enable them to assume a more desirable station in general society. Regarding the promotion of this object as part of the duty which I have to perform in delivering this course of lectures, I consider the philosophy of Botany, comprehending the *internal structure* or *anatomy of plants*, and the properties of their organic structure, the phenomena they present, and the laws which govern their actions, or the *physiology of plants*, of paramount importance. These different branches of the science cannot be separated without disadvantage to the whole; and it is impossible to have an accurate knowledge of any of the parts separately, all and each being indispensable for the acquisition of the science, and even for its application to practical purposes. An acquaintance with the physiology of plants gives an interest to *descriptive* and *systematic* Botany which they do not independently possess. The student sees proof of a higher life in plants than he before conceived; and he becomes convinced, in examining the functions which their organs are destined to perform, that animals and plants are only separate links in the great chain of organic nature. A new source of pleasurable gratification, also, is the result of his investigations. Every blade of grass upon which he treads, wherever the verdant carpet of nature is spread, in the vale or on the mountain—every tree, under which he shelters from the noonday beam—and every flower and fruit the form, beauty, colour, or fragrance of which captivates his senses, excite an interest and an attention to which he was previously a stranger. In every part of creation he perceives evidence of matchless skill and beneficient design; and in the examination of the exquisite organization of the vegetable race, and the functions connected with it, whilst his intellect is expanded, his vanity is humbled. In attempting to scan the mysteries of life, he is constrained to acknowledge the truth of the remark—"That the most exalted philosophy, and the most profound science, stand convicted of incapacity before the minutest monad, or the most dwarfish plant."

If the study of vegetable physiology, like every other branch of science, was indeed only valuable as an exercise of the mental energies, it would be still worthy of the best attention of the

student; for it is not essential in the endeavour to determine the laws and detect the causes of phenomena, that they should be such only as have a decided application to the wants of our species. The interest, indeed, which such investigations afford would not be diminished were such an application found to be impossible; nor are the faculties of man intended to be exerted only for the attainment of means requisite to administer to his corporeal wants, or the ordinary necessities of his race. It must, however, be acknowledged, that the dignity of science is enhanced when its light is reflected upon the arts of life; and the history of its progress has established the fact, that often the most abstract speculations have led, in course of time, to practical results of the greatest importance. But if the scientific part of this course shall not appear to the student calculated to advance the practical advantages which he anticipates from the study of Botany, he must not place out of view the improvement which it affords, as a mental exercise, in training his mind to thought; and in rendering more acute and accurate his powers of observation. Like the capital to the Corinthian column, which, whilst it ornaments, does not lessen the strength of the shaft; the acquisition of any branch of science connected with his calling will tend to elevate him in the opinion of his fellow men, without, in any degree, diminishing his fitness for the performance of the ordinary duties of his station.

I have entered, gentlemen, into these details of some of the advantages to be derived by the pupils who are to be my auditors, from the more scientific part of this course; because it is my intention to treat more minutely of the physiology of plants, than might be considered necessary by those who look only to the advantages to be derived from the practical objects for which these Lectures have been instituted. But I am too well acquainted with the liberal and extended views, in reference to education, of the founders and supporters of this great Association, to doubt that I shall secure their approbation, in my endeavour to impress a scientific character upon this Course of Lectures.

With respect to that part of my subject which is most likely to prove practically useful, namely *descriptive* and *systematic botany*, it requires little argument to prove its importance to those whose daily occupation is connected with plants or their productions. The necessity of being able to distinguish one plant from another, and to recognise plants by their physical characters, is every day acknowledged, and the want of the information which this requires, has placed the Chemist and Druggist in the power of the *herb-collectors*, who either from ignorance, or from interested motives, have brought to them plants of a nature the most opposite to those which are required,

so as not only to defeat the intentions of the physician, and to display the ignorance of the pharmacopolist, but even to supply, by a poison, the place of a salutary medicine. I have picked out from amongst the flowers of the wild Chamomile (Anthemis *nobilis*), flowers of the common Chamomile (Matricaria *chamomilla*), and also those of Feverfew (Pyrethrum *parthenium*); and in what ought to have been bundles of Conium *maculatum*, I have found Æthusa *cynapium*, Myrrhis *odorata*, Myrrhis *temulenta*, and several other umbelliferous plants; the stigmata of Crocus *sativus*, which constitutes Hay-saffron, is adulterated with the florets of Marigold; the leaves of Verbascum *thapsus* are often gathered for those of Digitalis; the leaves of the Cherry-laurel (Cerasus *lauro-cerasus*), have been mistaken for those of Laurus *nobilis*, a mistake fraught with the most serious danger, and many similar errors, unnecessary to be now specified, have resulted from an ignorance of Botany.

The importance of the knowledge of the natural classification of plants, now generally adopted, instead of the artificial arrangement of Linnæus, holds out so many advantages, that there can be only one opinion of its superiority in a practical point of view, for the arrangement of vegetable medicinal agents. It makes the inquirer acquainted with not only every useful circumstance connected with the affinities of plants, but it also enables him to form a tolerably accurate estimate of their medicinal properties and other qualities; and the knowledge which it affords to him of even one plant of any order, enables him to substitute, when absolutely necessary, upon fixed principles, any one of the same order for that one which is usually employed.

The influence of climate, of cultivation, locality, and season, in modifying the active properties of medicinal plants, can only be correctly understood by the botanist; and this is one of the objects connected with the occupation of the Druggist, upon which the greatest benefit has been derived from vegetable physiology. The nature of the soil, its dryness or moisture, the degree of exposure of plants to heat, light, and air, all contribute to modify their medicinal qualities; and to afford a rational explanation whence it happens that the same plants collected in one locality, or in one year, display great activity, whilst in the next year, or procured from a different locality, they are almost inert. Many plants do not acquire active medicinal properties until they arrive at a certain period in their term of existence, whether they be *annuals*, *biennials*, or *perennials*. Annuals are active only before the seed is perfected; thus, the anodyne and soporific property of the poppy is not fully developed until after the petals fall, and the germen has acquired some bulk, but its activity is weakened as the seeds ripen—a fact which has been overlooked

in the cultivation of the poppy, for the sake of the capsules, in this country. The Henbane and several other biennials possess little activity in the first year of their growth; the *lactura sativa* displays no decided narcotic property until it is in flower. It is almost unnecessary to remark that the explanation of these variations, and of many others connected with medicinal plants, can only be obtained from vegetable physiology, whilst descriptive botany enables us to recognise the age of plants by their physical characters. The importance, indeed, of botany to the Druggist is too obvious to require much comment: without it he is unable to recognise plants and detect the blunders and impositions of herb-collectors; to determine the period of the life of a medicinal plant, which is required to be of a certain age before it can be employed; and to explain, from the nature of the soil, the degree of exposure, the season of the year, and other circumstances connected with the development of the medicinal principles of plants, the causes of their inactivity when that occurs. It is unnecessary to remark how much, on the other hand, an acquaintance with botanical science raises his character.

Such, gentlemen, is a very brief view of the advantages to be derived from the study of Botany to the rising race of Pharmacopolists. With respect to the mode of studying it, the student must not rest satisfied with the information which he receives from the lecturer, or from the perusal of books; he must, when it can be done, make his appeal to nature; and not rest satisfied until he has convinced himself, through her means, of the truth and accuracy of the statements to which he has listened, or of the accounts which he has perused.

With regard to the method which I have adopted for delivering my instructions, I must refer to the syllabus of the course, which is in your hands; and I trust that I shall be able to fill up the outline there sketched in a complete and efficient manner. It is my intention to select living medicinal plants for my illustrations, or when these cannot be procured, to have recourse to medicinal plants from the *hortus siccus*, or to moist preparations. In the systematic part of the course, each natural order shall be illustrated by a minute description of one or two plants belonging to it, so as to impress upon the mind of the student its prominent characters. It is not in the transient view of a multiplicity of plants, belonging to any order, that we become acquainted with them; the minute and discriminative examination of the features of a single plant, will do more to make us familiar with the order in which it is arranged, and the properties of its congeries, than the indiscriminate examination of a thousand.

Plants are organized beings; that is, individuals composed of a number of essential and mutually dependent parts: in

common, therefore, with animals, they possess a principle which is in continued action, and which operates in such a manner, that the individual parts which it forms in the body, are adapted to the design of the whole: or, in fewer words and more generally intelligible language, plants are *living bodies*. Like animals, they are the offspring of other beings similar to themselves; they *grow*, are endowed with *excitability*, have their periods of *infancy*, *adult age*, *decay*, and *death*. Their affinity to animals is much closer than is commonly supposed; let us, therefore, before entering upon the examination of their structure and particular functions, enquire briefly in what particulars they *accord with*, and in what they *differ from* animals.

The vital or creative power exists already in the germ, in plants as well as in animals; and, by its influence, the essential parts of the future plant are formed. In the egg, the entire vital principle resides in the germinal disk alone—all the other parts are destined for its nourishment after incubation; the same is the case in the seed, in reference to the embryo—the cotyledons, or seed-lobes, being solely intended for its nourishment after germination. As in the egg, so in the seed, the vital principle may exist in a quiescent state; neither the egg nor the seed can be said, under such circumstances, to be *truly* alive, but both possess, and are capable of retaining, for considerable periods, that peculiar or specific state, which has been termed the "*capability of living*." It is justly so termed, because whilst it continues, life may be manifested by the influence of stimulants, fitted to act upon its vitality; for without the action of these upon it, we cannot pronounce that life is present; yet it may, nevertheless, be present, and manifest itself by none of the phenomena of life, until it is roused into activity by appropriate stimulants. If I take two seeds, closely resembling one another in every respect, I cannot determine in which the capacity of living resides, or, in other words, which is capable of germinating, until I subject each, under exactly the same circumstances, to the influence of *heat*, *air*, and moisture within certain limits. The one germinates—the other does not; I, therefore, feel authorized to say, the former was alive—the latter dead. This condition is preserved in both only so long as the vital principle remains quiescent, and is unaffected by external agents; but it is longer preserved in the seed than in the egg. The seeds of some plants remain capable of germination after being buried in the ground, beyond the influence of the atmosphere, for one hundred years; beans have germinated after two hundred years; and an onion, taken from the hand of an Egyptian mummy, the age of which was supposed to be nearly two thousand years, had been made to

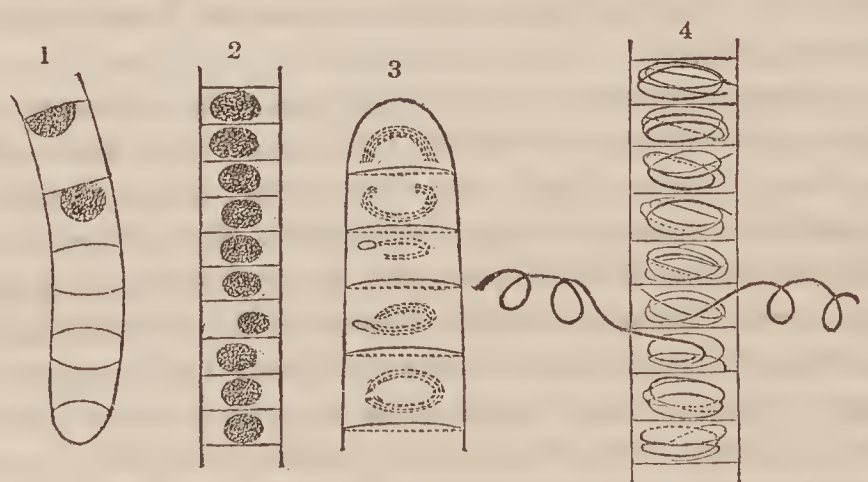
grow. In the egg and also in the seed, however, as soon as either is subjected to the influence of *air*, *heat*, and *moisture*, the germ becomes developed, and the action thus begun, if continued, influences the growth of the plant or the animal; but if the circumstances necessary for its continued action fail, then the individual either falls into a condition of temporary inaction, as in *hybernation*, or death ensues. In this respect, therefore, the closest affinity exists between plants and animals; the influence of the renovating excitants or, as they are termed "*vital stimuli*," are common to both; but one of them is more essential to plants than to animals, namely, *light;* for without this stimulus plants languish and die; and the higher they stand in the scale of vegetation, the more essential is light, as a vital stimulant, for their existence.

It might be supposed that the lateral generation of plants, namely that renewal of the individual which is the result of budding, or gemation, is sufficient to distinguish them from animals, but the opinion is erroneous, as we find that the formation of gems or buds is common in the animals belonging to the class *polypifera*. In the hydra, for example, we perceive the gems developed as small roundish elevations upon the cylindrical body of the animal, and when examined in this state, they are, like the first formation of the buds in plants, mere masses of cells; but as their growth proceeds, these cells undergo a special arrangement, so as to produce the different tissues of the body, and acquire the proper form of the polype, on the same principle as the bud in the plant is gradually developed, until it terminates in the perfect branch. The same influence of formative action, which produces the compound branch, or a branch which annually gives origin to others, is observed to operate in the compound polypiferous animals, which do not separate from the parent stock. Like the plant which becomes a tree, the successive generations of those united polypes, giving rise to a constantly extended mass, form an animal tree, closely resembling the vegetable one, which must be justly regarded as a collection of distinct individuals, united only by a common stock; but each containing in itself that vital power, which enables it to exist, independent of the others with which it is associated.

But it may be argued, that even budding animals differ from plants, by the frequent spontaneous separation of the buds when they acquire the perfect organization of the parent, as occurs in the hydra. This, however, also occurs in plants, as for instance, in the Lilium *bulbiferum*, Polygonum *viviparum*, and Poa *alpina*, in the latter of which the whole panicle frequently consists of gems, instead of flowers, which, as they enlarge weigh down the

flower stalk, and, on reaching the ground, strike root, and detaching themselves, become new individuals. Budding animals still further resemble plants in being propagated, also, by ova, or impregnated bodies, as well as by buds. Thus, in the hydra, the ova appear on the cylindrical body of the animal, the ovaries being seated there, and the ova are readily distinguished from the buds, by their hard horny shell.

The bisexuality of the greater number of plants forms no better distinctive feature between them and animals than those characters already noticed: many of the *echinodermata*, the *infusoria*, the *radiata*, and the *annelida* contain both male and female organs in the same individual. A still more striking affinity may be traced in the existence of those animalcules termed spermatozoa, in the male fecundating organs of plants as well as in those of animals, although they are more rare in the vegetable kingdom. In the anthers of the moss called *spagnum* exist cells, each of which contains a filament with an elongated ellipsoid head rolled up in a spiral form, and which moves whilst within the cells, and continues its movement when it escapes from them. This is still more curiously displayed in Chara. Each of the pollen particles is an articulated thread, within each of the joints of which a single spermatic animalcule is enclosed. It is at first like a small grain, which gradually assumes a curved appearance, and ultimately that of a spiral convolution. Until this occurs it is motionless; after a time, it breaks through the walls of the cell, and moves very briskly in the water.



This diagram displays, 1, 2, a mucus molecular substance in each cell of the early pollen thread; 3, the first irregular form of the spermatozoa; and 4, their complete development, and the escape of two of them, from the cells which contained them.

Plants, like animals, possess excitability, or the faculty of being acted upon by external stimuli, impelling them to the exertion of their vegetative powers. *Light* acts on plants, directing the growth of the stem—vigour and colour of the plant—the direction of branches—position of leaves—the opening and shutting

of flowers, as seen in the Calendula, Taraxacum, Daisy, and Anagallis. Is light the sole agent? Certainly not, for some flowers blow at night, as, for instance, the night-flowering Cereus. Heat influences the protrusion of buds; and other stimulants also influence the vegetable irritability; so that cut plants which have faded revive when placed in water impregnated with camphor. Plants, also, like animals, have their excitability exhausted by over-stimulus, and are acted upon by sedatives (such as Hydrocyanic acid) and Sulphuretted hydrogen, in the same manner as animals.

Besides the physical and physiological distinctions that have been pointed out as marking the line between an animal and a plant, some also are furnished by Chemistry. Thus, through its means we perceive, that one of the great functions of the plant is to decompose water, and assimilate its components to the vegetable tissue, whilst it is one of the properties of animal life, constantly to reform it from its elements. The oxygen, derived from the atmosphere, by whatever means it is introduced into the animal system, is consumed in producing carbonic acid and water, both of which are thrown off as excretions. It is true that water is exhaled in great quantity from the surfaces of plants, but it is that fluid which has been taken into the system of the plant and has not undergone decomposition; it is not actually formed in the body of the vegetable as in that of the animal. It is in the process of vegetation that *proteine*, also, is formed from the constituents of water, carbonic acid, and ammonia, and it is this *proteine* which forms the blood and muscular flesh of animals.

The close affinity between plants and animals is demonstrated even in the chemical nature of their products. Thus, MM. Dumas and Cahours have ascertained that vegetable albumen has the same composition as the albumen of serum and of eggs—that caseum, which has the same composition as albumen, does not differ whether it is procured from animal milk or from the juices plants—and that fibrine, whether from the blood or from the preper juice of plants, has always more nitrogen and less carbon than albumen or caseum. The influence, indeed, which Chemistry has lately displayed in unfolding the exact relation of composition between vegetable and animal matter, has given a new impulse to the study of the vegetable kingdom, and in this augmented interest, the study of Botany is more or less involved.

If plants and animals agree in so many particulars, it may, justly, be demanded in what does the differences between them consist? The most striking, and those that appear most obvious, are, undoubtedly, *sensation* and *voluntary motion*, which are the attributes of animals but not of plants.

Those motions of animals which we term voluntary, differ most

materially from those of plants, by resulting in the voluntary operation of a single organ—namely, that of the mental faculties—and not merely in accordance with the harmonious action of the whole organism. The movements of the Hedysarum *gyrans* approach nearer to those of volition than any others in the vegetable kingdom with which I am acquainted. The leaves of the plant are trifoliate, or consist of a large middle leaflet, and two small lateral leaflets. When the sun beams full upon the central leaflet, it moves, but here we have a cause adequate to the effect, without referring any part of it to volition: the two lateral leaflets, however, display an incessant rising and falling, independent of the influence of external stimuli. It is also asserted that, if these movements be stopped by holding the leaflets between the fingers for a short space of time, and then withdrawing the fingers, they will move more rapidly, as if to make up for the constrained quiescence which they had suffered. This certainly has somewhat of the character of volition. Some of the movements of plants, also, seem to indicate sensibility. Dutrochet directed the focus of a burning-glass on a single leaflet of a mimosa or sensitive plant—the impression was propagated gradually to the other leaflets. But sensibility must not be confounded with *irritability*, a principle which plants possess in common with animals; but, with the exception of the solitary observation of Dutrochet, which I have mentioned, we cannot affirm that any of the movements of plants manifest consciousness, without which they cannot exert voluntary movements. The simplest animals manifest both sensation and volition, even those that are fixed to rocks and other bodies, and which present a ramified and vegetable form, for instance the compound polypes; for each individual polype displays both sensation and volutary motion. It is difficult to explain satisfactorily the movements of some plants to simple irritability. Thus we find that plants placed in an apartment with light admitted at one side only, not only turn the upper surface of their leaves to the light, but bend their stems and branches towards it. The florets of the White Clover are so aggregated as to form a globular head; after the lower circle of florets is impregnated, the whole of that circle turns down, as if to admit light and air to the next circle, which in its turn gives place to the third, and to on until all the florets have been impregnated. This succession of acts for an obvious purpose has, assuredly, a close resemblance to consciousness; yet we cannot affirm that it is so, or that the movements are voluntary. Many similar examples might be mentioned, but none of them, not excepting the movements of the *Oscillatoria*, and some of the lower vegetables, which more closely resemble volition than those of some of the simpler animals, can be referred to volition.

Plants, again, differ from animal sin having no nervous system.

I was formerly believed, that the functions of apparent sensation, of motion, and of digestion, in the lower and simplest animals, were performed independently of nerves: but more recent investigations have discovered a nervous system in many of these singular beings; and Ehrenberg has described and represented very distinctly, a trace of both vessels and nerves in the more perfect rotatoria, and in some infusoria, animals so minute as to evade our unassisted vision. Indeed, every succeeding day's experience renders it more and more probable that all animals, without distinction, have a nervous system; whilst nothing of the kind has ever been detected in any member of the vegetable kingdom.

Another obvious distinction between plants and animals is connected with the function of digestion, and the digestive apparatus. The simplest animals, those which may be turned outside in and, nevertheless, perform their functions as well as in their natural condition, have an internal cavity, into which their food is taken at intervals; but vegetables are nourished by the surface, not at intervals, but by continual imbibition. It must not, however, be overlooked, that some plants seem to require the aid of solid food, or at least the results of the decomposition of solid matter; and are furnished with an apparatus for entrapping animals evidently for this purpose. This is beautifully exemplified in the leaf-appendages of Dionæa Mucipula; and in the flowers of Leersia *lenticularis** To both of these singular plants the decomposed animal matter seems to be a requisite stimulus for maintaining the health of the plant; and this opinion receives support from the fact, that when the plants have languished in hot-houses, where there were no flies, they have been revived by placing fibres of meat upon the fly-traps. Still, however, this food does not enter a stomach—the act of closing upon the fly is not an act of volition; and the fact does not invalidate this point of distinction between plants and animals.

It has been supposed that, because the sap rises in plants, and in the interior of some internodia, and cells of some simple plants, a rotatory motion of fluid can be perceived, plants like animals, have a circulation of fluids. But the opinion is at least disputable, the sap in plants ascend only once, for that which is termed the descending sap of the plant is the proper juice prepared in the leaf, and the fact of currents being observed in opposite directions in the leaf of Chelidonium *majus* is no proof of the existence of a circulation. But it may be asked, Is the motion in the chara first noticed by Professor Corti, or

* This species of Leersia was found by Mr. Pursh growing on the islands of Roanoak River, in North Carolina. Its flowers have appendages on the corolla, similar to those attached to the leaves of Dionæa *mucipula*; and it uses them in the same manner as the Dionæa, for catching flies.

that discovered in the cells of Valisneria *spiralis*, or in the hairs of the radicle fibres of frog's bit, Hydrochares *morsus ranæ*, any proof of a circulation? I reply, that the motion of a fluid in the cells of a plant, effected in a manner at present not understood, is very different from a general circulation of the sap. The true circulation in animals is derived from an internal impelling power, not from external influences. But whilst we contend for this distinction between animals and plants, we must admit that in some of the former, in many simple animals, neither heart nor vessels, nor circulation, have been discovered.

A more distinctive character is obtained in the products of the respiratory function in plants. Respiration is performed by many simple animals by the entire surface, as by plants, but the products even in this case are different. In plants the process consists chiefly in the conversion of carbonic acid and water into vegetable matter; hence oxygen is exhaled by the leaves, and carbonic acid absorbed by them from the atmosphere; and it is by the decomposition of that acid in the leaf, that the greater part of the oxygen is restored to the air. And although plants exhale carbonic acid during the night, and in the shade, yet the quantity is small; and plants are, in reference to their respiration, a balance in the opposite scale to animals—they remove from the air the carbonic acid exhaled from the lungs and spiracula of animals, and re-supply the oxygen requisite for their respiration. Without the vegetable tribes, the atmosphere would soon cease to be fitted for the present race of animals; without the carbonic acid formed by animal respiration, plants would lose the greater part of their nutriment; by their reciprocal action the atmosphere is preserved nearly absolutely unchanged. Upon the whole we may sum up this comparative view of plants and animals by saying, that whilst they are endued with many properties and functions common to both, they possess others, sufficiently distinctive, which prevent them from being regarded as parts of the *same link* in the great chain of vital existence.

PROVINCIAL TRANSACTIONS.

BATH BRANCH OF THE PHARMACEUTICAL SOCIETY.

The Committee of the Bath Royal Literary and Scientific Institution having granted the use of their lecture-room for the purpose, an arrangement has been made with Mr. Henry M. Noad (Member of the Chemical and Electrical Societies of London, Author of Lectures on Chemistry, &c., &c.) to deliver an evening course of Twelve Lectures on Practical and Experimental Chemistry, which commenced on Friday, May 5th, at eight o'clock p.m., and is continued on the succeeding Fridays and Tuesdays at the same hour. (Terms 10s).

OTHER ORIGINAL COMMUNICATIONS.

THE SPONTANEOUS IGNITION OF "RED FIRE."

We believe it is not generally known that the compound of nitrate of strontia, sulphur, antimony, and chlorate of potash, used pyrotechnically as "red fire," is liable to explode spontaneously, under certain circumstances which are not well understood. An accident of this kind took place recently in the house of one of our Members, who had prepared about a pound of this compound. It had been made only a few days, and was in a bottle on the counter, wrapped up in paper for sending out: without any cause which could be assigned, combustion suddenly took place, a column of red flame rising to the ceiling, and filling the shop with smoke and noxious vapours. The flash was soon over, and fortunately less mischief was done than might have been expected, as the occurrence took place during the day, and a supply of water was at hand.

Mr. Scanlan published an account of a similar accident, in a periodical entitled *The Records of General Science*, No. 8 (1836), shortly after which another instance occurred in the house of Messrs. Hayle and Flood, of Dublin, whose premises were seriously damaged, although not destroyed, by the conflagration of two pounds of the powder, which had been left on the counter in a brown-paper parcel. Mr. Scanlan prepared some of the compound for the purpose of investigating the cause of such a result. On removing the stopper after it had been kept for some time, an abundance of red fumes issued forth, indicating the presence of a quantity of nitric oxide. We understand that Mr. Scanlan has not completed his experiments. The circumstance is mentioned as a caution to those who occasionally prepare combustibles for pyrotechnical purposes.

AMMONIA INFLAMMABLE.

TO THE EDITOR OF THE PHARMACEUTICAL JOURNAL.

Sir,

The inflammability of ammoniacal gas, is a fact, which, however, still remains generally questionable and problematical, though I had shown, eighteen years ago, that aqua ammon. fortis would burn with continued flame, if introduced into chlorine. It is merely necessary to pour a little of the liquid into a deflagrating spoon, and plunge it into a deflagrating jar of recently prepared chlorine, when it will spontaneously ignite, and continue to burn.

I am, respectfully, Sir,

Your obedient humble servant,

Portland Place, Hull, 19*th May*, 1843. J. Murray.

CURIOUS PHENOMENON WITH THE VAPOUR OF SULPHURIC ETHER.

TO THE EDITOR OF THE PHARMACEUTICAL JOURNAL.

Sir,

Many years ago, I discovered that the vapour of sulphuric ether, at common temperatures, like carbonic acid gas, might be laved from one vessel to another, pumped out, &c., and would flow through a funnel or other orifices, and numerous are the accidents that have occurred from ignorance of this fact. I subsequently found that similar experiments might be repeated with the vapour of sulphuret of carbon, naphthaline, &c.

A very curious phenomenon may be exhibited by pouring the *invisible vapour* on the surface of equally invisible carbonic acid gas, the *former will float on the latter*, and being kindled, will exhibit in air a floating stratum of flame.

I am, respectfully, Sir,

Your obedient humble servant,

J. Murray.

15, *Portland Place, Hull, May* 19, 1843.

EXTRACTED ARTICLES.

ON THE ODOUR OF MUSK.

BY ANTON WIMMER.

The author was induced, by a remark in *Geiger's Handbuch der Pharmacie*, "that *golden sulphuret of antimony* destroyed the *odour* of *musk*, and that the *kermes mineral* changed its *odour* to that of *garlic*," to investigate the subject more closely, and although he corroborates the statement, he does so not without some limitation. He was not able to detect the garlic odour mentioned on addition of kermes mineral to musk, although its odour was certainly modified by it. By adding spirit of ammonia, he found that the odour was in both instances reproduced in its full vigour and integrity, consequently concludes that the golden sulphuret of antimony does not destroy the odour of the musk, but merely forms a new combination with it, in which the odour is suppressed. Caustic potash, and concentrated phosphoric acid, added to this odourless mixture of musk, with a preparation of antimony, produced a peculiar musty odour, which was readily converted into the pure musk odour, on addition of caustic ammonia. From these data, Wimmer infers that the odour of musk is dependent on a *peculiar weak organic acid in combination with ammonia*, that this acid has separately a musty odour, an hypothesis by no means inconsistent with the generally adopted opinion that the odorous principle is developed by a peculiar putrefaction of the substance of the musk grains, for in this process the acid and the ammonia may both be formed. As regards the action of the golden sulphuret, he believes that the sulphur, which stands in an electro-negative relation to the acid and the ammonia, enters into a peculiar chemical combination with the musk, which is readily disturbed. In conclusion, he proposes prescribing musk in this combination with antimony, for those who are averse to its odour.—*Repert. für die Pharm., Band* xxix, *Heft* 1, page 51.

ON THE FORMATION OF THE GELATINOUS CAPSULES OF BALSAM OF COPAIBA.

BY ADOLPH STEEGE,

Court Apothecary at Bukarest.

Fig. 3.

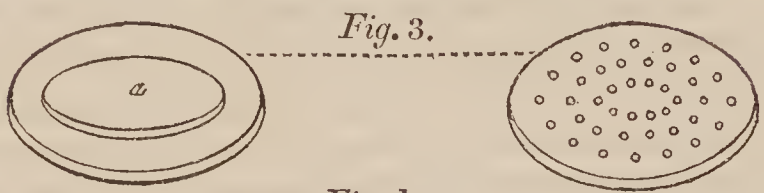


Fig. 2.

Fig. 1.

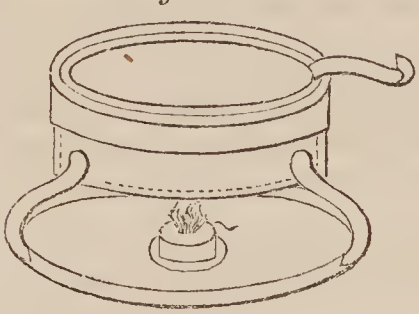


Fig. 5.

Fig. 6.

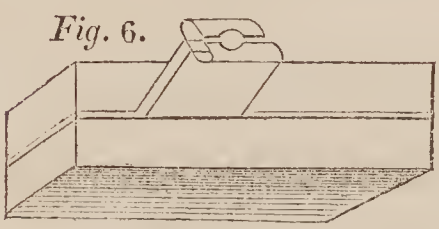
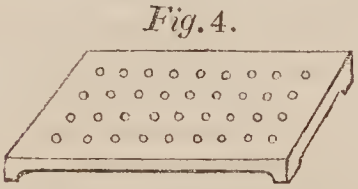


Fig. 4.



The imperfect account given in the journals, of the process of the formation of these capsules, led the author to think that a more explicit description would be of some service. The capsules are formed by dipping an iron mould or form into a concentrated aqueous solution of ordinary or bleached gelatine. Its consistence should be that of thick honey. The solution must not be so tenacious as to form fibres, should be passed through a hair-sieve, and kept warm in a receptacle (fig. 1) over warm water. The forms or moulds (fig. 2), are of iron furnished with a polished head or bulb above, and below with a pointed screw. The handles are rough or fluted from the middle downwards, to facilitate the process of screwing them into the wooden platters by the thumb and forefinger.

The wooden platters (fig. 3) must be somewhat smaller than the interior of the tin vessel (fig. 1), perforated at certain distances with several holes, corresponding with the screws of the moulds, and are furnished on the reverse with a pedestal (*a*) for the convenience of holding them.

When all the models are fixed on the platter, the heads are to be oiled with almond oil, and then dipped into the warm solution beyond the mark (*b*) in (fig. 2), below the head or button. This immersion is to be repeated according to the consistency and degree of temperature of the solution.

The margin of the platter is now to be rested on the left hand, and turned by the pedestal (*a*) with the right hand, until the gelatine congeals, and can no longer drop off. In this manner, four or five platters may be proceeded with. The moulds are now to be separately screwed off the first platter, The gelatine must then be cut through at the ring marked off on the mould,

and the capsule is to be removed gently by three fingers, and laid on a loose hair sieve to dry, or on a pasteboard plate perforated with holes of proportionate dimensions. They should at first be dried in a cool situation, afterwards in a graduated temperature. The remainder of the moulds are to be subjected to a like process. When the capsules are perfectly dry, they should be placed in an upright position on a tin stand (fig. 4) furnished with depressions for their reception, and are to be filled to the margin by means of a glass drop-tube (fig. 5). The balsam which may adhere to the sides of the capsules, is to be carefully wiped off. Thus prepared, they are to be placed in the tin press (fig. 6) and quickly immersed into the warm solution of gelatine, with the open part or mouth downwards. The press (fig. 6) is to be swung several times to and fro, and then hung on laths with the superior portion downwards, until the capsules are perfectly dry, and thus finished.

Perfectly transparent capsules may be obtained by using isinglass. Elastic capsules are formed by adding a portion of sugar to the gelatinous mass, filling them before they are perfectly dry, and closing them as above.—*Repert. für die Pharm. Band* xxix, *Heft* 2, *page* 158.

ON SENNA LEAVES.

BY CARL HEERLEIN, IN BREGENZ.

A PRIZE question concerning cathartin proposed by the Pharmaceutical Society of Munich, induced me to compare cathartin procured from Alexandrian senna, with the cathartin obtained from Rhamnus catharticus. An extract of senna prepared by boiling water, from the senna leaves, was precipitated by sugar of lead. A quantity of sugar of lead, equal to a fourth of the weight of the senna, was necessary, in order to arrest all further precipitation. The pale yellow fluid was now filtered, and sulphuretted hydrogen passed through it, until a filtered specimen was no longer rendered turbid by the gas. I convinced myself, at the same time, that it is impossible to remove the last traces of oxide of lead by carbonate of potash. The fluid, after the removal of the sulphuret of lead by filter, was clear and nearly colourless, and was now evaporated to the consistence of an extract. This extract amounted to about fifteen per cent. of the weight of the senna-leaves employed. Cold alcohol dissolved nearly the whole of it, for the gelatinous residue amounted to 1.5 per cent. only. This alcoholic solution was decomposed by means of sulphuric acid diluted with alcohol, until no further precipitate took place. This precipitate was sulphate of potash, amounting to nearly two per cent. of the weight of the senna-leaves. The alcoholic fluid was now filtered and brought in contact with white lead until all the sulphuric acid was removed, then refiltered and treated with sulphuretted hydrogen to remove all the oxide of lead that might be held in solution. The fluid filtered off from the sulphuret of lead was evaporated by steam, and yielded a dark brown soft extract, amounting to about fourteen per cent. of the leaves of senna, the cathartin so called by Messrs. Lassaigne and Feneulle. It was not yet perfectly soluble in water, and a considerable quantity of a dark brown resinous substance was separated from an alcoholic solution, on addition of distilled water. To obtain an aqueous solution free from all turbidity, it was necessary to repeat the filtering evaporation and solution several times.

The cathartin now obtained, had the following properties :—In mass it appeared as a dark brown clear extract, without any predisposition to crystallization. A thin layer of it seen through a glass was transparent, of a dark brown or yellow colour. It had a peculiar unpleasant odour, and an acidulous, bitter, but unpleasant taste. It attracted moisture from the atmosphere, and obtained then the consistence of honey. In water or

alcohol it is perfectly soluble, but not in ether. It is darkened by alkalies, without undergoing any further change. Dilute acids may be added to it, without rendering it turbid. Concentrated sulphuric acid decomposes and carbonizes it. Infusion of galls produces a dirty yellow precipitate. Sugar and acetate of lead render the solution opalescent. Protosulphuret of iron darkens its colour. Potassio-tartrate of antimony, sulphates of copper and zinc, and chlorides of platina and mercury, produce no changes. Tincture of iodine yields, with an aqueous solution of cathartin, a weak precipitate of iodine, but not with an alcoholic solution. Burnt on platina, cathartin leaves an ash, which reacts as an alkali.

From these experiments it appears, that the so-called cathartin of the senna-leaves is an extract composed of several constituents, amongst which are a free vegetable acid, a salt with an alkaline basis, and a brown bitter extractive; that it, therefore, does not deserve the name of cathartin, an observation which its therapeutic action would tend to corroborate.

I found that it does not contain the purgative principle of the senna. Five grains of this cathartin=℥ij of senna-leaves, were given to two patients without effect. Ten grains administered to the same patients on the following day, were equally inefficacious. The patients refusing to take this nauseous preparation again, I continued the experiments myself. Observing a rigid diet, I took before dinner ℥ss of cathartin in three different doses, viz., ℈ss every two hours, but without result. On the following day, I took four doses of ℈j each, at the interval of every hour and a half, without the least effect. I now discontinued my experiments, to economize my supply of cathartin*, perfectly convinced that this preparation does not contain the active principle of senna, and consequently is not entitled to the name of cathartin. I have obtained an analogous product from Rhamnus catharticus, which I have not yet accurately examined, but have determined at my earliest leisure to seek to obtain the active principle of cassia senna and Rhamnus catharticus by some other method.—*Repert. für die Pharm., Band* xxix, *Heft* 2, *page* 216.

REPORT OF MM. DUMAS AND PELOUZE

TO

THE ACADEMY OF SCIENCES OF PARIS, ON A PAPER BY MM. FORDOS AND GELIS RESPECTING

A NEW OXYGEN ACID OF SULPHUR.

The authors of this paper, respecting which the Academy have directed us to report, have discovered a new combination of sulphur and oxygen, in carefully examining the action of iodine on the hyposulphites and more particularly those of soda and barytes.

The crystallized hyposulphite of soda is composed of Na O S_2 O_2, 5 H O. Dissolved in water and treated with iodine, this salt absorbs one-half its weight, and the liquor is coloured only by the excess of iodine beyond the proportion of one equivalent of that body to two equivalents of hyposulphite.

This reaction is very simple: two equivalents of hyposulphite are decomposed by one equivalent of iodine; while the sodium of one-half the soda

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* Mr. Heerlein has kindly sent me the remainder of his cathartin. It is interesting to learn that the cathartin of Lassaigne and Feneulle is not the active or purgative principle of the senna. It remains yet to determine whether the true cathartin is left in the precipitate produced by the acetate of lead, or whether, as a substance soluble in alcohol, but insoluble in water, it is removed by the repeated solution in water, filtering, and evaporation, necessary for obtaining it.—*Buchner.*

unites to the iodine, the corresponding equivalent of oxygen goes to the elements of the two equivalents of hyposulphurous acid, forming one equivalent of the new acid, which combines with the second equivalent of soda:

$$2\,(Na\,O\,S_2\,O_2 + 5\,H\,O) + I = 10\,H\,O + Na\,I + Na\,O\,S_4\,O$$

This acid, then, is formed of four equivalents of sulphur and five equivalents of oxygen; and as this composition may be represented by one equivalent of hyposulphuric acid, and two of sulphur, the authors, availing themselves of this relation, have proposed to call their acid the *bisulphuretted hyposulphuric acid.*

Of all the hyposulphites, that which answers best for the preparation of the new acid, is that of barytes. Take this salt, held in suspension in water, and add iodine little by little until the mixture begins to be coloured. The iodine and hyposulphite rapidly disappear, and are transformed into iodide of barium and *bisulphuretted hyposulphate* of barytes; meanwhile, this latter salt having insufficient water for its solution, is gradually deposited and the liquor finally becomes entirely solid. This is treated with alcohol until completely deprived of free iodine and the iodide of barium which it contained.

The new salt is obtained in the form of a white crystalline powder, which only requires to be dissolved in a small quantity of water, and obtained again by spontaneous evaporation, when the bisulphuretted hyposulphate of barytes is deposited in fine crystals. It may be obtained still more easily by adding absolute alcohol to a concentrated aqueous solution; in a day or so the crystals will be formed and deposited. In order to isolate the acid, the exact quantity of sulphuric acid required to precipitate the barytes is to be added; taking care to operate with very dilute liquors, so as to avoid an elevation of temperature that may alter the acid.

The bisulphuretted hyposulphuric acid is colourless and without smell, and has a distinctly acid taste. It may be reduced to a tolerable degree of concentration without being decomposed; but it has but little stability, and even at ordinary temperatures, its elements are gradually disunited, giving rise to the production of sulphur, and sulphurous and sulphuric acids.

Diluted sulphuric and hydrochloric acids do not affect it, but nitric acid, on the contrary, rapidly decomposes it, and precipitates the sulphur.

It causes no cloudiness in solutions of barytes, of iron, of zinc, or of copper.

The bisulphuretted hyposulphate of barytes, is the salt which MM. Fordos and Gelis have used to establish the composition of their new acid.

This salt crystallizes in long prismatic needles, of great brilliance and perfectly white. On passing chlorine through a very weak aqueous solution, the whole of the sulphur which it contains is converted into sulphuric acid. The barytes retains a quantity of this acid, which is precisely a fourth of the whole quantity, so that, on adding an excess of chloride of barium to the filtered liquor, a fresh precipitate of sulphate of barytes is formed, the weight of which is three times that of the former. This experiment shows, that the salt contains one equivalent of barytes to four equivalents of sulphur.

The proportion of oxygen combined with these four equivalents of sulphur has been determined by depriving the liquor of excess of chlorine, by means of metallic mercury, and precipitating with nitrate of silver: one gramme of the salt afforded 5.175 and 5.110 of chloride of silver. These numbers correspond with the following formula:

$$Ba\,O\,S_4\,O_5,\,2\,H\,O + 7\,H\,Cl. = 2\,H\,O + Ba\,O\,S\,O_3 + 3\,S\,O_3 + 7\,H\,Cl.$$

Of the twelve equivalents of oxygen required for the transformation of four equivalents of sulphur into sulphuric acid, seven are taken from the water, and five consequently exist in the bisulphuretted hyposulphuric acid.

The bisulphuretted hyposulphate of barytes, exposed to the action of heat,

is decomposed into water, sulphurous acid, sulphur, and sulphate of barytes, the weight of which latter salt has been found, according to several experiments, to be 58.4, 58.5, and 58.7 per cent. that of the salt. These numbers would indicate two equivalents of water of crystallization in the barytic salt. Theory would then give 58.63 per cent.

We have repeated the experiments of MM. Fordis and Gelis, and have arrived at the same results.—*Comptes Rendus.*

ON A NEWLY DISCOVERED PLANT, YIELDING THE GUM AMMONIACUM.

According to Ancher Eloy, a genus and species of the family umbelliferæ, not yet described, the *Diserneston* gumniferum*, Jaubert and Spach (*Illustrationes Plantar. Orientalium*, 5 livr, Paris, 1842, tab. 40, pp. 78, 79) is the chief plant whence the gum ammoniacum of commerce is derived. It is a native of the south of Persia, and is met with between Ispahan and Chiraz in the following places :—At Majar or Meier, between Koumechah and Choulgissoun, at Yezdikhast, and further on. The genus is allied to siler and agasyllis, but differs from them in the irregularity of its inflorescence, its large cup-shaped, petaloic, and irregularly crenatoplicate disk, in the extremely fine stripes of its pericarp, and in the very fine vittæ to be traced on the epicarp. Agasyllis differs from it in the pouch-shaped (*schlancharlige*) fruit. The plant, of which the plate above referred to merely represents fragments and portions of the fruit, acquires a considerable height. The herbaceous portions are, when the plant is young, flocculent, and finely hairy, but becomes smooth with age. The inferior leaves are very large, and doubly composited, the divisions simply or doubly innate, the segments unequal, sometimes bimarginal, sometimes two or three lobed, decurrent at the base. The conspicuous inflorescence consists of numerous ball-shaped partial umbels, sessile or pedunculated, placed on a large leafless panicle. The petals appear to be white. The fruit cremocarpium is oval or ovate, compressed dorsally, like a lentile, with narrow wings. The parts of the fruit (*mericarpia*) are on the back six or nine ribbed with five delicate filiform principal ribs.

The plant mentioned by Ancher Eloy (died at Ispahan, 1838), in his catalogue, No. 1462, and in his dried collection, No. 4595, could only be imperfectly examined in fragments. The fruit corresponds with the seeds frequently found in the gum ammoniacum. This traveller has given no description of the mode of gathering the gum. It exudes from the plant, and collects in small tears, especially in the axillæ of the partial umbels. The quantity of gum adherent to the specimen examined by Messrs. Jaubert and Spach, was too trivial to be submitted to chemical analysis.—*Pharm. Central Blatt, No.* 15, *April* 12, 1843. K.

ON INDIAN COPAL.

BY FILHOL.

In commerce, Copal is distinguished into the *hard* and the *soft* kinds. The chief varieties of the former, are :— First, *copal from Madagascar* (in large flat yellow pieces) which, when cold, is tasteless and odourless ; but when heated, diffuses an aromatic odour : this kind is rather rare. Secondly, the *East Indian copal*, the most common variety of commerce ; it is rough on the surface, bearing the impression of sand. The best specimens are colourless, and in small pieces, constituting the *copal from Calcutta*. Mixed with these, and even met with as a distinct variety, are warty, citron-yellow, angular pieces, which appear to be identical with the rough rust-brown

* So named after the authors of an *Introduction à une Flore Analytique et Descriptive des Environs de Paris.* Ernest Germain and Ernest Cosson!

pieces, internally transparent, known by the name of *Bombay copal.* To this class may be added also the *copal in tears* or drops (in Guibourt's collection) ; *they are of a yellow colour, not brown*, but rough externally. A third, but very rare variety, is brought from the *Brazils and south of Africa.* We receive all our copal of commerce from India, whatever its primary source may be. In the Calcutta variety, pieces of all the others are to be found, nor is a distinction readily to be made between the white copal of Calcutta, and the yellow resin of Bombay, the difference appears to depend only on the care bestowed on the selection and purification of the pieces. The following elementary analysis would also tend to confirm the identity of the Indian varieties :

	Calcutta copal.			Bombay copal.	Madagascar copal.
	White.		*Yellow.*		
C.	80.34	80.29	80.66	79.70	79.80
H.	10.32	10.32	10.40	10.40	10.78
O.	9.34	9.19	8.77	9.90	9.42

Gay Lussac found 76.8 carbon. This is explained by its quick oxidation in the atmospheric air. Dried at 100° in the air, and exposed for three days, the quantity of carbon was found by the author to be 76.54. A piece of white copal dried in an oven during three months, underwent an alteration in colour, and contained

C.	77.05	77.34
H.	10.06	10.11
O.	12.89	12.55

Pure white copal appears to be less easily oxidized by the air than the yellow. A sample of Durozier's *soluble copal*, which is soluble in alcohol and ether, without residue, contained

C.	71.42	71.34
H.	9.24	9.22
O.	19.34	19.44

The solubility is entirely dependent on an alteration which the resin undergoes in the air. Soluble copal is prepared by rubbing down the resin with hot water to an impalpable powder, collecting the residue in tin cases to which the air has free access. This change is, therefore, effected at a common temperature, if the particles of the resin be intimately divided. The copal which had been exposed to the air for three days, at a temperature of 100°, had become, in a month's time, nearly wholly soluble in alcohol, and totally so in ether and spirit of turpentine, and contained only 73 per cent. of copal.

The author found *hard Indian copal* to consist of five different resins, viz..

1. *Alpha resin* $=C_{40}H_{31}O_8$.
2. *Beta resin*, composed of C. 77.04, H. 10.03, and O. 12.93.
3. *Gamma resin* $=C_{40}H_{31}O_3$. This resin constitutes the greater part of copal.
4. *Delta resin.*
5. *Epsilon resin* $=C_{40}H_{31}O_2$.

Soft Indian copal, met with in commerce in large white globular tears of 60.80grs. in weight, is externally covered with impurities, but internally pure. It melts at 100°, is soluble in oil of turpentine, and slightly in pure alcohol. Analysis gave the following results :—

C.	85.30	85.36
H.	11.50	11.53
O.	3.20	3.11
	100.00.	100.00

The similarity of the soft variety of copal with gum anime would tend to corroborate the author's hypothesis, that all resins from anime to soft copal, Indian, and Madagascar form a continued series differing only in the increased quantity of oxygen they contain.—*Pharmaceutisches Central Blatt.*

CONDITIONS OF ANIMAL AND VEGETABLE LIFE.

The following table represents in a condensed form the leading doctrines which have recently been propounded by M. Dumas, in connection with other French Chemists, with reference to the phenomena of animal and vegetable life.

THE VEGETABLE	THE ANIMAL
Produces the neutral azotized substances	Consumes the neutral azotized substances
——— fatty substances	——— fatty substances
——— sugar, fecula, and gum	——— sugar, fecula, and gum
Decomposes carbonic acid	Produces carbonic acid
——— water	——— water
——— ammoniacal salts	——— ammoniacal salts
Disengages oxygen	Absorbs oxygen
Absorbs heat	Produces heat
——— electricity	——— electricity
Is an apparatus of reduction	Is an apparatus of oxidation
Is stationary.	Is locomotive.

PATENT FOR IMPROVEMENTS IN THE MANUFACTURE OF ALUM.

Peter Kagenbusch, of Lyth, in the County of York, Dyer, *for certain improvements in the treatment of the Alum Rock, or Schist, and in the manufacture and application of the products derived therefrom.* Patent dated 13th of October, 1842; Specification enrolled 13th of April, 1843.

Mr. Kagenbusch makes four distinct claims:—The first is for making "Water Heaps," or heaps of the alum-shale broken small, and sprinkled with water as the heap is laid. The heaps are to be plastered over in the usual way, and are to stand from three to eight months.

The 2d, for burning these "water heaps," at the expiration of this time, in kilns or close heaps *with turf;* wood or coal may be used.

The 3d, for steeping the alum-shale, when burned, in the pits along with kelp, or for steeping kelp in raw alum-liquor, in the proportion of three-quarters of a ton of kelp to as much alum-shale, or alum-liquor, as will yield one ton of alum.

And the 4th, for burning the exhausted shale on iron plates, alone, to make puzzolana, or with lime, in kilns,—made into bricks or lumps for hydraulic cement.

In order fully to appreciate these improvements, it is necessary to inform our readers, that the alum rock on the Yorkshire coast yields, besides alum, another salt in equal quantity, which is a mixed sulphate of magnesia and iron. This salt was formerly suffered to run into the sea, but of late years about one-half of it has been preserved for sale in all the works—the Boulby works alone recovering the whole of the sulphate of magnesia entirely free from iron. About one ton of pure sulphate of magnesia may be obtained for every ton of alum by proper management.

It is well known, that some of the alum rocks on the Continent yield alum by spontaneous decomposition—which is the object intended to be effected by the first claim in the present patent—and it is equally well known that the Yorkshire alum schist will not, and the fact is noticed in a paper published in the 12th vol. of the Phil. Trans. for 1676, p. 1052, by D. Colwell, Esq., in which he says, "the rock exposed to the air and moisture, crumbles and produces green vitriol, but being burned, is fit for alum." And we have the authority of the late Mr. Sowerby, of Whitby, that such a mode of heap-making was tried at the Mulgrave works without success.

The second claim is for the employment of turf as fuel.

The third claim is for the exclusive privilege of "advancing backwards" to the rudest mode of employing kelp, described in the paper above alluded to as "practised commonly in the alum works in Yorkshire, from Searboro' to the River Tees," but long since laid aside.

Muriate, or sulphate of potash, or sulphate of ammonia, are now used by alum-makers as the source of the alkali necessary to form alum—the potash salts being obtained from kelp.

One ton of absolutely pure muriate of potash (K Cl) will yield potash equivalent to six and a quarter tons of alum; but it is found, in practice, that not more than from four to five tons of alum are produced from one ton of the muriate of potash of commerce. Now, one ton of kelp yields from five to six cwt. of such muriate. The patentee, then, we see, employs about the *practical* equivalent of kelp to produce a ton of alum, but he would appear to be altogether ignorant of the fact, that the carbonate of soda and sulphuret of sodium included in the kelp, will, as far as they go, decompose his alum, and that the sulphate of soda will remain in his "mother liquors" to contaminate the sulphate of magnesia, by which means he will commit, we hope, an *involuntary* fraud upon the purchasers of this latter salt.

There is another mischief to the alum-maker, in this rude mode of employing kelp, which may not be generally anticipated. An eminent Chemist has informed us, that he has proved the presence of sulphocyanogen compounds in kelp, by their producing the characteristic blood-red colour with the iron in the alum-liquor. This has already been productive of serious injury to the alum in the Mulgrave Works, from the employment of muriate of potash drenched with kelp "mother liquors."

The fourth improvement, "for burning the exhausted shale on iron plates alone," is not likely to be interfered with by cement-makers, whose object is to make money at the same time.

It has been for a long time the opinion of the best chemical authorities that the "artificial alum makers" on the Tyne will, in time, supersede the "natural alum makers," as they are incorrectly termed, seeing that the process followed by each is equally artificial; and these *improvements* do not tend, in the slightest degree, to shake that opinion.—*Mechanics' Magazine.*

BOOKS RECEIVED.

Hortus Collinsonianus. *An Account of the Plants cultivated by the late* Peter Collinson, Esq., F. R. S.

An Effort to refute the Arguments *advanced in favour of the Existence in the* Amphide Salts, *of Radicals, consisting, like Cyanogen, of more than one element.* By Robert Hare, M.D., Professor of Chemistry in the University of Pennsylvania.

A Letter to William Whewell, *of Cambridge, in Reply to certain Allegations and Arguments advanced in a Pamphlet entitled, "A Demonstration that all Matter is heavy."* By Robert Hare, M.D., &c.

Objections to Mr. Redfield's Theory of Storms.

Additional Objections to Redfield's Theory of Storms.

Strictures on Professor Dove's Essay, "*On the Law of Storms.*" By Robert Hare, M.D., &c.

DR. TURNBULL ON PRUSSIC ACID VAPOUR. *John Churchill.*

This is a treatise on the use of Prussic acid, Chlorocyanic acid, and Bisulphuret of carbon, in the form of vapour, as a remedy for certain diseases in the eye. In addition to the statements which had previously been published by the author, respecting the efficacy of these agents, numerous cases, illustrating this mode of treatment, are described in the work, to which our readers are referred.

FATAL ACCIDENT.

The following accident occurred a few days ago, at Newton, in Cheshire, about eight miles from Manchester, and was thus reported at the Coroner's inquest, as well as by the surgeon called in:

A poor woman, whose child was ill, was recommended to give it a little manna: she accordingly sent a neighbour to purchase a pennyworth from the shop of a person who unites the trades of provision-dealer, draper, and druggist. A small lump of a dark substance, having a strong odour, was served to her by the female servant of the Druggist, and as neither the messenger nor the mother had ever seen manna, a little of it was mixed with water and given to the infant, which was shortly afterwards seized with convulsions and died. A neighbour who was called in found the paper containing the drug to have "opium" written upon it, the contents were also found to be opium.

The servant girl, in her examination, stated, that opium was asked for by the messenger. This was positively contradicted, and one of the shop drawers, labelled Manna, was found to contain opium, weighed up in pennyworths. She was committed to take her trial, at Chester assizes, for manslaughter.

TO CORRESPONDENTS.

A. W.—M. P. S. wishes to know how the instrument commonly called a "storm-glass," is prepared. [This instrument consists of a glass tube sealed at one end, and furnished with a brass cap at the other end, through which the air is admitted by a very small aperture. The tube is nearly filled with the following solution—

Camphor, ʒiiss.
Nitrate of Potash, gr. xxxviij.
Muriate of Ammonia, gr. xxxviij.
Water, ʒix.
Rectified Spirit, ʒxj.

Dissolve with heat. At the ordinary temperature of the atmosphere, plumose crystals are formed.

On the approach of stormy weather these crystals are often observed to occupy only the bottom of the tube where they appear to be compressed into a compact mass, while, on the other hand, during fine weather, they assume their plumose character, and extend a considerable way up the glass. These results depend upon the condition of the air, but they are not considered to afford any indications that can be relied upon, of the approaching state of the weather. When exposed to a very low temperature, the Com-

pound Camphor Liniment bottle affords the same appearance and indication as these storm-glasses.]

Liquor Taraxaci.—Mr. Earland has sent the following formula for this preparation, taken from the Annals of Chemistry: "Dandelion roots, perfectly clean, dried and sliced ℥xij. Infuse for twenty-four hours in a sufficient quantity of distilled water to cover them. Press and set aside that the fecula may subside; decant and heat the clear liquor to 180 Fahr., filter the liquid whilst hot, and evaporate spontaneously until the product weighs 14 ounces. To this add 4 ounces of rectified spirit. If properly prepared, it resembles in colour pale sherry."

O. O.—Unguentum Tabaci (United States Pharmacopœia): Fresh Tobacco cut in pieces 1 oz., Lard 1 ℔, boil the tobacco in the lard over a gentle fire until it becomes friable, then strain through linen.

A. F. F. wants a formula for ginger-beer.—

℞ Radicis Zingiberis, ℥viij.—Aquæ ferventis Cong, vj.—Potassæ Bitartratis, ℥iv.—Sacchari Albi, Hiv.—Olei Limonis, gtt xl.

Infuse for twelve hours and strain; add four table-spoonfuls of yeast; allow it to stand for a few hours and bottle the clear liquor. Instead of essence of lemon one lemon, and four additional ounces of sugar may be added to each gallon if preferred. The wholesale makers impregnate the ginger-beer with carbonic acid by a soda-water machine, instead of using yeast.

"Juvenis" wants a formula for Blacking.—

Ivory Black, ℥xii.
Treacle, ℥iv.
Sperm Oil, ℥i.
Vinegar, Oij.
Oil of Vitriol, ℥ij (by weight).

Mix the ivory black, treacle, and sperm oil, then add the vinegar gradually, stirring after each addition; lastly, add the oil of vitriol *gradatim*, stirring constantly until the effervescence ceases. Sugar-candy is recommended by some persons as a substitute for treacle.

W. B., A. P. S.—1. Bichromate of Potash is obtained on the large scale, by calcining a mixture of chrome-iron ore and saltpetre; lixivating the calcined mass with water, and treating the neutral chromate of potash, thus obtained, with half an equivalent of sulphuric acid. The bichromate is separated from the sulphate of potash by crystallization.—2. When Liq. Ammon. is ordered in prescriptions, that made according to the Pharmacopœia should of course be used.—3. We frequently reply to correspondents by post.

"A Correspondent," (Manchester), has sent us four samples of aromatic confection in powder, obtained from different sources, and having a very different appearance.—No. 1. is a fair sample, prepared by simply mixing the powders without moisture.—No. 3. is similar in quality, but the colour of the saffron has been developed by moistening, and afterwards drying the powder.—No. 2. appears to be a fine sample prepared in this way, probably ground in a mill, which method produces a finer powder than can be obtained by trituration in a mortar.—No. 4. is no better than it should be, the colour resembling that of Armenian bole. When the dry ingredients of aromatic confection are mixed, the result has a pale brown colour, resembling Dover's powder. By sprinkling the powder with spirit, the yellow tint is developed and is retained after the spirit has evaporated. Cold water produces this effect, but not so readily as spirit or boiling water.

"Novice" (Bath).—Acidum Hydrocyanicum dilutum P. L., should contain two per cent. of real acid. See Phillip's Translation (4th edition, page 23).

B. R. G. I.—Rain or river water may be preserved for a considerable time in an open barrel, the inner surface of which has been charred, which practice is, we believe, adopted in the navy.

C. W.—We cannot recommend any cheap substitute for syrup of saffron in dispensing.

QUANTUM SUFF. enquires, which is the most powerful diuretic we are acquainted with? Quantum Suff. is referred to his medical attendant. See also Dr. Pereira's Materia Medica, page 199.

We are not acquainted with Driffield's oils for horses.

Mr. MARTIAL.—Nitrate of silver consists of oxide of silver combined with nitric acid in their equivalent proportions: the substitution of the nitrate for the oxide would be unjustifiable, and might be dangerous.

PHARMACIEN suggests, that a few elementary articles, explaining the meaning of chemical terms (such as peroxide, bichloride, nitrate, &c.) would be useful to pharmaceutical students, by facilitating the study of Chemistry. [We could not be expected to give such instruction as would supply the place of a Manual of Chemistry, and every such work contains the information alluded to, generally under the head Chemical Nomenclature. We have not room to recapitulate every month the advantages to be derived from a connection with the Society, but must refer our correspondent to Vol. II., No. 10, the leading article, p. 613; and the other articles referred to in the foot-notes, p. 618.]

K. M. (Liverpool).—1. Why does Lin. Saponis congeal when made with common white soap, and not when made with Castile? [We have never prepared soap liniment with any other than Castile soap; but since the oleate of soda is more soluble than the stearate, it might be expected that a solution of Castile soap, which is made with olive oil, would be less likely to be gelatinous than one in which a soap containing tallow had been used.] —2. In making Linimentum Camphoræ, ought the camphor to be powdered with spirits of wine before adding the oil? [This is not necessary, as camphor is soluble in oil.]—3. If nitrous acid be exposed to the air in a wide-mouthed bottle, is it converted into *nitric* by absorbing oxygen from the atmosphere? [Nitrous acid, exposed to the action of air and light, disengages a lower oxide of nitrogen (probably deutoxide), which, combining with the oxygen of the air, is again converted into *nitrous* acid, and, if water be present, into *nitric* acid.

J. E. B. enquires, "In making the *solution of chlorinated soda*, is there any objection to the use of the chlorine water of the Edinburgh Pharmacopœia, and dissolving in this the carbonate of soda?" [The chlorine water of the Edin. Pharm. contains sulphate of soda, which is not an ingredient in the solution of chlorinated soda. There is also not sufficient chlorine in the chlorine water for the purpose proposed.]

G. H. C. (Newcastle).—Spongy platinum is used in Dobereiner's instantaneous light apparatus.

"A CORRESPONDENT" (Thirsk) suggests that a lecture on Chemical Manipulation would be acceptable to many students. [We recommend to our correspondent Faraday's or Griffin's Chemical Manipulation.]

"AN ASSOCIATE" (Liverpool) has sent an extract from the *Liverpool Mercury*, being an address to the associates of that place, and advocating the establishment of lectures, and other means of extending Pharmaceutical Education. [We should be glad to see some judicious measures adopted to effect this object. For this purpose chiefly the Society was established, and although it originated with the present members, we must look to the associates (or future members) to render it permanent, by seconding the efforts already made.]

A. P.—When the Pharmacopœia directs a decoction to be boiled to a certain quantity, that quantity indicates the whole of the liquid present; in some cases it is necessary to press the ingredients.

"AN APPRENTICE, May 16th," enquires, what books we should recommend him to purchase? [This is a difficult question to answer without knowing the length of his purse. We have generally recommended "Lindley's Elements of Botany," "Thomson's Dispensatory," "Pereira's Materia Medica," "Graham's or Turner's Chemistry," and "Selecta è Prescriptis."]

"An Associate" (Portsea).—An answer next month.

"An Apprentice" (Tonbridge).—The price of "Selecta è Prescriptis," is 5*s.*; "Thomson's Dispensatory," 21*s.*; "Christison's Dispensatory," 18*s.*

J. C. W. (Lancaster).—We prefer answering such questions by letter.

Mr. Sparks suggests, that the therapeutic action of Theine should be tried on persons both in health and disease, before any theories respecting it are received.

W. S. B. (Preston).—An M. P. S. can use his own discretion about taking an assistant who is not an A. P. S.

"A Member" (Wellington).—The charter of the Pharmaceutical Society is not published; the leading features of it were explained in our April number, page 613, and the technicalities are similar to those of other charters.

S. D. W.—The extracts from the Medicine Stamp Act next month.

W.C.—No person can be compelled to join the Pharmaceutical Society, but those who join must conform to the laws, one of which makes it necessary to pass an examination. Indentures of apprenticeship are not indispensable, provided the candidate has been engaged in the business during the usual term of five or six years, and has qualified himself. See Vol. II., No. 2 and 3; Notices inside the Cover; also pages 57; No. 4, page 173; No. 8, page 481; No. 10, p. 613.

℈j. (Bristol) need not scruple to apply to the local Secretary, Mr. Knight, for information. See Vol. II., No. 2, page 57; No. 8, page 481.

"A Founder," (Clifton).—See the above numbers.

"An Associate" having joined the Society before July 1, 1842, may become a Member without examination when he goes into business.

I. W. T. P.—See the Notice inside the Cover of Vol. II., No. 2.

"Cardamom" objects to pay a guinea for forty lectures on Botany, and enquires why the fee is not the same as that for the course last year, which was about half the length.

M. P. S.—We are obliged to defer the subject of retail prices.

B. B. W.—*See* Vol. I., page 219. Vol. II., page 411.

A Member in the City, alludes to the practice which is too prevalent, of encouraging business on Sunday, by keeping two or three shutters down, lighting the shop like a gin palace, and pushing the sale of cigars and soda-water. [Such practices are very much to be regretted. Several attempts have been made to introduce a reform. (*See* Historical Sketch, page 65.) We hope the assistants of the present day will, when they commence business on their own account, recollect and avoid the errors, the evil of which they now suffer.

"A Subscriber"—R. C. C. C.—Mercury may be separated from an amalgam with tin, by distillation.

"A Bottle."—The efficacy of Brandish's alkaline solution depends upon the caustic potash it contains, and not on the presence of chloride of potassium and sulphate of potash resulting from the impurities of the pearl-ashes and wood-ashes employed in the process.

S. P. E.—1. A person in business on his own account and wishing to become a Member of the Pharmaceutical Society, would pass the major and not the minor examination. Further particulars will be found in the bye-laws which are in course of preparation and will shortly be published. 2. In dispensing medicines, accuracy cannot be too strongly insisted upon. In dividing powders, those who are but little accustomed to dispensing, ought decidedly to weigh each powder. 3. Prussian blue is soluble in a solution of oxalic acid, and has no tendency to separate.

"A Druggist," May 20th, is referred to Vol. II., No. 1, pages 4 and 5.

Advertisements to Mr. Churchill, Princes Street, Soho.

Other Communications to The Editor, 338, Oxford Street (before the 20th, if answers be desired in the ensuing number).

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